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THE UNIVERSITY OF ALBERTA

STIMULUS CONTROL: ACQUISITION AND GENERALIZATION OF PLAY

by

LORRAINE MARIE MACPHERSON-COURT

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF EDUCATION
IN
SPECIAL EDUCATION (MULTIPLE DEPENDENT HANDICAP PROGRAM)

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON ALBERTA

SPRING 1989

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled Stimulus Control: Acquisition and Generalization of Play submitted by Lorraine MacPherson-Court in partial fulfillment of the requirements for the degree of Master of Education

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Date: January 12, 1989

DEDICATION

In loving memory of Helen Irene MacPherson who first inspired me to teach.

To my parents, Glen A. MacPherson and Rita M. MacPherson, who continued to nurture
my desire to teach.

ABSTRACT

The present study tested the effectiveness of an increasing assistance model as a procedure for teaching independent play skills to severely handicapped students. Four students were involved in the study. One student was diagnosed as having Down's syndrome resulting in moderate mental retardation with an I.Q. between 40 and 55. The three remaining students were all diagnosed as having severe mental retardation with I.Q.'s between 25 and 40. At the time of the study, the students' ages ranged from 5 years 4 months to 7 years 9 months. With the increasing assistance model, two methods of stimulus control were compared to determine which was more effective in the acquisition of play skills during play training sessions and to determine which was more effective in the generalization of play skills from training sessions to free play sessions. The two methods were compared using an alternating treatment design. Each method consisted of a baseline phase (*A*), an acquisition phase (*B* and *E*), a generalization phase (*C* and *F*), and a free play phase (*D* and *G*). In Method 1, the acquisition phase (*B*) involved an increasing assistance method of prompting combined with a fixed interval reinforcement schedule for appropriate play. In the generalization phase (*C*), there was no prompting and a varied interval schedule was used to reinforce appropriate play. During the free play session (*D*), there was no prompting and no reinforcement of appropriate play. In Method 2, the acquisition phase (*E*) also involved an increasing assistance method of prompting combined with a fixed interval reinforcement schedule for appropriate play. However, an auditory cue was heard by the student prior to the administration of each reinforcer. During the generalization phase (*F*), there was no prompting and a varied interval schedule was used to reinforce appropriate play. However, the auditory cue was continued on a fixed interval schedule. During the free play phase (*G*) in method 2, there was no

prompting or reinforcement of appropriate play, however, the auditory cue was continued on a fixed interval schedule. The increasing assistance treatment method was found to be an effective procedure for teaching play skills to these students. The effectiveness of the method of transfer of stimulus control used to generalize play skills acquired during the acquisition phase to the generalization and free play phases depended on the individual student. For two of the students, there was no significant difference between the two methods used to transfer stimulus control, one student benefitted to some extent from Method 1 and one student benefitted to a degree from Method 2. Regardless of the method used, all students transferred play skills to the generalization phase and three of the four students transferred play skills to the free play phase.

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Chapter 1

INTRODUCTION

Play is an important component of early-childhood, elementary, secondary and special education curricula. Through play, children in early childhood education learn a variety of social, physical and educational skills. In elementary, secondary, and special education, students learn similar skills, including those skills necessary for many adult leisure activities. For severely handicapped students, the acquisition of play skills is more difficult than for non-handicapped students, and systematic instructional procedures are required to train play skills to students with severe, multiple handicaps. Therefore, research is required to determine effective procedures for teaching independent play skills to severely handicapped students. Because severely handicapped students have difficulty generalizing their skills to other environments, activities and people, research is also required to determine effective procedures for enhancing the generalization of play skills across different conditions. The present study tested the effectiveness of an increasing assistance model as a procedure for teaching independent play skills to four severely handicapped students. One student was diagnosed as having Down's syndrome resulting in moderate mental retardation with an I.Q. between 40 and 55. The three remaining students were all diagnosed as having severe mental retardation with I.Q.'s between 25 and 40. At the time of the study, the students' ages ranged from 5 years 4 months to 7 years 9 months. With the increasing assistance model, two methods of stimulus control were compared to determine which was more effective in the acquisition of play skills during play training sessions and to determine which was more effective in the generalization of play skills from training sessions to free play sessions.

Chapter II

LITERATURE/REVIEW

Play and Severely Handicapped Students

Definition of play. According to a dictionary definition, play refers to an individual's ability to occupy oneself in amusement, game, sport, or other recreation (Morris, 1982). Wheman (1977), however, reviewed several definitions of play and emphasized the elusiveness of defining play and cited Ellis's (1973) definition as perhaps the greatest effort in providing a theoretically and conceptually sound definition:

> A definition of play can be formulated depending on the perspective one takes in examining play. Play may be defined as motive, it may be defined as voluntary behavior or content, or it may simply be considered undefineable. Ellis views play as a need to maintain an arousal level of activity. Pure play can occur in the absence of all extrinsic consequences (Wheman, 1977, p. 14).

Wheman concluded that it was irrelevant to continue attempting to define play, and believed that "critical measures of playful behavior or use of leisure time is probably of much greater utility" (Wheman, 1977, p. 15). Some of these measures, such as type of interactions of severely handicapped students with toys, are particularly relevant to this study and will be reviewed later.

Benefits of play. Play is a vital component in the lives of both children and adults. Regardless of age, each individual sets aside some time in his or her schedule to participate in leisure activities. Most individuals participate in play because they find it rewarding, motivating and pleasurable (Colbens, 1985; Falvey, 1986; Hopper & Wambold, 1978; Wehman, 1977, Wuerch & Voeltz, 1982). Play is also important in the development of a variety of skills, for example, social, motor, communication, perceptual and intellectual skills (Affleck, 1985; Albtecht, 1985; Colbens, 1985;

Fagan, 1986/87; Wehman, 1977; Wuerch & Voeltz, 1982). Because play enhances the development of a variety of skills, it is an integral part of early childhood education curricula.

Play is also a major component of the curricula used with severely handicapped students, and there are several reasons for teaching play skills (or leisure skills) to these students. First, participation in preferred leisure activities enhances a student's quality of life and is congruent with the principle of normalization (Falvey, 1986; Sailor & Guess 1983; Wuerch & Voeltz,1982). In addition, among handicapped students, play may be used to enhance the development of several other collateral skills such as language, problem solving, cognition, personal-social behavior, and gross and fine motor skills (Falvey, 1986; Wambold & Bailey, 1979; Wuerch & Voeltz, 1982). Third, the acquisition of play skills may decrease inappropriate behaviors and increase appropriate behaviors in handicapped students (Wehman, 1977; Wuerch & Voeltz, 1982). In addition to providing pleasure and entertainment, and teaching a variety of collateral skills, play may be used to increase a student's involvement in community, neighborhood, and home environment activities, and can function to decrease the amount of supervision required (Falvey, 1986).

Problems associated with teaching play to severely handicapped students. Wuerch and Voeltz (1982) described some of the problems associated with existing leisure time training programs for handicapped students. One difficulty they mention is that many programs emphasize training outside of home, school, or community environments. Training outside of these environments tends to limit generalization of skills to activities within the student's immediate environment. For example, a student who received running instruction during a Special Olympic's training camp, may or may not be able to generalize the skills learned through this instruction to his own school environment. Also, activities taught within environments like the Special

Olympics may limit the usefulness of the activity to the handicapped person in dealing with daily leisure time. For example, a student who learns to become an archer may have no opportunity to use the skills involved in archery during leisure activities in his immediate environments. Wuerch and Voeltz also found that the entry level skills required for most leisure programs are higher than those commonly possessed by severely handicapped students. In some leisure programs designed for severely handicapped persons, materials included were developmentally appropriate but age-inappropriate for most handicapped teenagers and adults. Furthermore, the types of activities that were age-appropriate were usually passive, expensive, and had to be purchased through catalogs. The authors also observed that most recreational programs required homogeneous functioning and skill levels among the participants. This requirement made it difficult to incorporate integration of handicapped persons with nonhandicapped persons. In addition, Wuerch and Voeltz found that most leisure programs have been evaluated by an assessment of the skills acquired by the participant but failed to assess the affective needs of the student. An affective assessment requires an evaluation of the student's preferences and enjoyment.

Several problems arise when attempts are made to teach play skills to severely handicapped students. Wehman (1977) outlined several of these problems. First, although the body of research is expanding, there are few guidelines available in the literature for teaching the acquisition of play skills. Mentally handicapped students fail to play spontaneously with toys. Lack of spontaneous and enduring play may result from cognitive, motor, and sensory handicaps that reduce the pleasurable or reinforcing aspects of play. As a result, severely handicapped students often require an external cue or prompt to get them involved with toys. Often prompts are used to teach students how or when to make the correct response. The challenge to educators of severely handicapped students is to transfer the control of the student's response from the

external cue (the teacher) to the naturally occurring stimuli in the environment (the toy).

Instructional Strategies and Handicapped Students

i) Stimulus control.. Prompts are stimuli (temporary assistance) that have control (stimulus control) over specific responses. Prompts are used to help students perform in a desired manner. Prompts may also be used to draw student attention to discriminitive stimuli signalling when appropriate responses should be made. There are four types of prompts: verbal, gestural, model, and physical. Various teaching strategies employ prompts and reinforcement to bring students under stimulus control of the naturally occurring discriminitive stimuli indicating when and how to respond. Snell and Gast have defined the process of stimulus control as follows:

> Stimulus control is achieved by reinforcing a response in the presence of one stimulus or one set of stimuli and not in the presence of other stimuli. This leads to an increased probability that a response will occur in the presence of the stimulus that resulted in reinforcement and a corresponding decreased probability that a response will occur in the presence of stimuli that did not yield reinforcement (Snell & Gast, 1981, p. 3).

Teaching strategies used to achieve stimulus control include errorless learning, decreasing assistance, graduated guidance (includes shadowing and spatial fading), time delays and increasing assistance. Numerous studies have been conducted to evaluate the effectiveness of each of these strategies. Hopper and Wambold (1978) and Wambold and Bailey (1979) used some of these techniques to increase independent play of severely mentally retarded children. The children who participated in these studies lived in a state residential facility for the severely and profoundly mentally retarded in Madison, Wisconsin. Four children participated in the Hopper and Wambold study and six in the Wambold and Bailey study. Their ages ranged from 4 to 13 years. Combinations of reactive and nonreactive toys were used in the studies (20

in the Hopper and Wambold study, and 29 in the Wambold and Bailey study). Reactive toys are toys "which when operated upon, sustain movement, tactile, auditory, or visual feedback" (Hopper & Wambold, 1978, p., 43). Nonreactive toys are "those which when operated upon do not sustain movement" (Hopper & Wambold, 1978, p., 43). A combination of intermittent reinforcement, verbal prompts, modeling, physical prompts and fading were used to increase the students' play skills. In the Hopper and Wambold study (1978), results indicated through the use of these procedures two out of four student's significantly increased their appropriate play behaviors and decreased their stereotypical behavior. In the Wambold and Bailey study (1979), four of six students studied showed considerable improvement in appropriate play; one student showed no change in the level of appropriate play and one student's level of appropriate play decreased.

ii) Increasing and decreasing assistance instructional procedures. A study by Hill, Wehman and Horst (1982) used an instructional cue hierarchy method involving an increasing assistance procedure with three severely and profoundly retarded adolescents to teach generalization of leisure and social behavior using a pinball machine. The procedure involved a model or demonstration of the entire skill by the instructor. After the demonstration, the instructor waited for an independent response from the student. If the response was not emitted within 10 seconds, the instructor provided increasing levels of assistance (verbal prompts, models, gestures, followed by physical guidance) until a response was occasioned. The results from this study indicated that severely and profoundly mentally retarded students could acquire and generalize use of an electronic pinball machine and exhibit appropriate social behavior.

Two experiments conducted by Santarcangelo, Dyer and Luce (1987), involved similar instructive techniques to increase play skills and decrease disruptive behavior in children with autism. Two children age 5 and 9 participated in the first experiment, both had been diagnosed as autistic with developmental delays. Two children ages 6

and 13 participated in the second experiment, one was diagnosed as autistic, childhood schizophrenic and the other had been diagnosed as autistic. During the first experiment, one of two types of training was introduced to the children in a systematic fashion. The first training condition, involved differentially reinforcing the children on a 30 second schedule of reinforcement for playing appropriately in their bedroom. Appropriate play was defined as "playing with a toy in the manner with which it was meant" (Santarcangelo et. al., p. 40). The children were prompted to return to the task if they were uninvolved or playing inappropriately at the end of the 30 second interval. The second training condition involved teaching the appropriate method of playing with two specific toys. Graduated guidance (introducing successively more prompting until a desired response was obtained) was used during mass trials to prompt the participants through the task-analysed steps for these two toys. The two toys were then returned to the children's bedrooms with a random selection of other toys. In this first experiment, the two children displayed an increase in disruptive behavior during the differential reinforcement phase, and disruptive behaviors decreased below baseline levels following specific toy training. Santarcangelo et al.(p. 42) concluded: "These data suggest that specific reinforcement of toy play may be a more effective and preferred approach to programming for generalization and maintenance of leisure when training children with disruptive behaviors." In the second experiment, "toy type was kept the same across all phases in an attempt to control for the possibility of a biased selection of toys in the specific toy training condition" (Santaracangelo et al., p. 42). Children in the second experiment showed no significant differences from those in the first experiment. Both children in the second experiment demonstrated decreased levels of disruptive behavior and maintained those rates with the introduction of toy play training.

Billingsley and Romer (1983) reviewed various research studies that had

compared the effectiveness of increasing versus decreasing prompting procedures. In the decreasing prompting procedure, a instructor begins with the amount of assistance necessary for the student to complete the task; over successful trials, the assistance is gradually decreased. In the increasing prompting procedure, instead of reducing assistance over time, the instructor begins with the natural cue or stimulus and increases the amount of assistance necessary for the student to complete the response. Latency intervals are inserted between the prompt levels to allow the student sufficient time to respond. Failure to respond results in the presentation of the next more intrusive prompt. Billingsley and Romer (1983) reported results that supported both methods.

Gentry, Day and Nakao (1979) compared increasing and decreasing prompting procedures in teaching four severely retarded males to perform two-choice color discriminations. They found that decreasing assistance methods resulted in a deceleration of error responses and an acceleration of correct responses, while increasing assistance methods produced an increase in error rates and a decrease in correct rates during probe trials. However, an additional study (Csapo, 1981) replicating Gentry et al., found the "increasing assistance approach more efficient during the fluency-building stage of learning, once a high proportion of correct responses and no-error rate characterized the learning pattern" (Csapo, 1981, p.45).

iii) Time delay instructional procedures : Snell and Gast (1981) reviewed several studies incorporating time delay procedures into their instructional strategies, and provided this operational definition of time delays:

> Time delay begins by pairing the controlling stimulus (prompts) with a second stimulus (natrually occurring stimuli) to which control is to be transferred. However, rather than fading the controlling stimulus, a delay is inserted between the presentation of the new stimulus (naturally occurring stimuli) and the controlling stimulus. That is, over successive trials or blocks of trials,

gradually increased amounts of time are inserted between presentation of the new stimuli and the controlling stimulus (Snell & Gast 1981, p. 4).

In the studies reviewed by Snell and Gast, time delay was found to be an effective method of eliminating prompts in a variety of tasks (simple discriminations, multiple discriminations, chains, or single responses) with little or no student error. However, Snell and Gast recommended that future research should be conducted in which the time delay techniques are compared with other methods of stimulus control.

Billingsley and Romer (1983) described three studies comparing the effectiveness of time delay and increasing assistance procedures. One study (Renzaglia & Snell, 1981), that compared the use of these procedures to promote the acquisition of manual signs by eight severely handicapped students, found time delay and increasing assistance equally effective in the acquisition of manual signs. A similar study (Bennett, Gast & Wolert, 1982) compared the relative outcomes of these two procedures in manual sign training with three severely handicapped students. This study found time delay to be more effective than the increasing assistance procedure. A third study (Godby, Gast & Wolery, 1982) provided object identification training to three severely handicapped students. This study found that less instructional time was required to acquire signs using the time delay method as compared to the increasing assistance method.

Billingsley and Romer (1983) concluded their review by raising several questions regarding the types of prompts that should be used for instruction. 1). If the task is a visual task, should verbal cues be included in the prompt hierarchy or would a verbal cue deter the student's attention away from the discriminitive stimuli? 2). Should environmental conditions be a deciding factor in choosing which type of prompt to incorporate into the prompt hierarchy? For example, if the immediate environment is extremely noisy, would a verbal cue be very informative? 3). Which is more effective,

short or long delay increments (between the natural cue and the prompt) and progressive versus constant time delay intervals? The authors suggested that further research with various levels and types of subjects and tasks is required to answer these questions.

iv) System of least prompts. In a more recent review, a number of studies incorporating the system of least prompts (referred to earlier as increasing assistance procedure) were evaluated (Doyle, Wolery, Ault, & Gast, 1988). Only studies involving the "presentation of a stimulus and opportunity to respond followed by the presentation of a prompt hierarchy that began with the least intrusive level of assistance and proceeded to more intrusive prompt levels" (Doyle et al., p. 28) were reviewed. Ninety articles in 10 journals were identified that had used the system of least prompts (SLP) as an instructional procedure. In 60% of the studies cited, the subjects had been diagnosed as having severe or profound retardation. The skills taught within these studies included discrete and chained responses in a variety of skill domains including the language and cognitive areas. Of significance to the present study, 62% of the reviewed studies used SLP to teach chained behaviors. In addition, 67% of these studies used a 4 level prompt hierarchy which consisted of three modalities, a verbal prompt (either direct or nondirective), a model or gesture, and a physical prompt. Slightly less than half the studies reported the length of the response intervals. The response intervals that followed the presentation of each level in the prompt hierarchy varied in length from 2 to 30 seconds. Of the studies that reported response intervals, the most common response interval was 5 seconds found in 48% of the reported response intervals. Doyle et al. found no identified explanation as to why a certain response interval was chosen over another. As well, only 46% of the reviewed studies specified the consequences for prompted correct responses which was some form of positive reinforcement. Variations also existed regarding the delivery of reinforcement.

For example, reinforcement was administered on those steps which required no prompts only, or reinforcement was administered only after the completion of all steps in the task analysis regardless of the number of steps requiring prompts. In 93% of the studies, the consequences for errors or no responses was the presentation of the next intrusive prompt level. Within these studies, additional consequences included verbal reprimands (e.g., "No"), additional pointing out of the original discrimintive stimulus (e.g., instructor repeats verbal cue) and a five second time-out procedure (e.g., instructor turns away from the student for five seconds). Doyle et al. noted that very few studies specified the consequence for the occurrence of an error at the final prompt level. In analyzing the effectiveness of SLP, Doyle et al. found that 85% of the studies reported that targeted behaviors were taught to criterion. That is, 85% of the subjects were able to perform the target behavior according to the conditions and standards specified in the instructional objective for the studies. However, these results should be interpeted with caution as only 53% of these studies reported efficiency data such as total instructional time and the number of trials to criterion.

It appears from the literature that SLP has been used more frequently than any other single strategy. However, there are still a variety of questions unanswered about the strategy. Some of them were identified by Dole et al. 1.) For what age levels is SLP most effective/ ineffective? 2.) For what students with which handicapping conditions is SLP most effective/ineffective? 3.) For what type of skills is SLP most effective? 4.) For what curriculum domains is SLP most appropriate? As noted earlier, more research is required comparing SLP to other procedures such as error correction procedures, time delay and most to least prompting.

Doyle et al. also noted that SLP is considered to be superior to error correction strategies. However, they conlcuded that "comparison of SLP to an error correction procedure that is implemented after errors and no responses would provide information on the value of prompt levels" (Doyle et al., p. 36). Studies of this nature would

support statements made about the superiority of SLP over error correction procedures. These authors recommended that further research be conducted to determine if certain subject characteristics may influence the effectiveness of SLP, time delay and most to least prompting. For example, Doyle et al. noted that SLP may be more effective when students are willing to take a chance and make an error verses when students respond only when they are sure they are correct. Doyle et al. also noted that most time delay studies were conducted with students who were imitative (able to imitate) because models were used as controlling prompts. Research is required to clarify if SLP would be as efficient as time delay if non-imitative students were involved in the study. Future research was also suggested to investigate the type of prompts and number of prompt levels within the prompt hierarchy. For example, would the student learn more efficiently if the prompts utilized the same modality as the response topography ? For example, would gestural and physical prompts be more efficient than verbal prompts if a task requires a physical response like picking up an object and placing it in a container? Also, do less intrusive prompts acquire control of a student's responding in order to allow the student to become progressively more independent? Or, do less intrusive prompts lengthen the time required for each trial, making instruction less efficient (Doyle et al., 1988)? Furthermore, do intermediate prompt levels interfere with learning because nonfunctional stimuli are inserted and separate the naturally occurring controlling stimuli and the response?

Because little is known about the ideal length for the response interval, Doyle et al. identified several pertinent questions relating to future research of response intervals:

> Would the efficiency of SLP be increased if progressively longer intervals were used as training continues, as is done with progressive time delay? Should controlling prompts have a shorter response interval than noncontrolling prompts? Should students be allowed and taught to signal the instructor to move to the next

prompt level? (Doyle et al., p. 36)

On a final note, Doyle et al. suggested that future investigations should research the role of reinforcement on prompted and unprompted correct responses. For example, investigation of whether or not a more rapid shift of stimulus control to the target stimulus will occur when unprompted correct responses are reinforced on a richer schedule than prompted correct responses.

Play Materials for Severely Handicapped Children

In addition to the research of instructional procedures, research has also been conducted on the selection of play materials for severely handicapped children. One such study conducted by Bambara, Speigel-McGill, Shores and Fox (1984), compared the effects of reactive and nonreactive toys with severely handicapped children's 'hands on' activity and visual attention to toy play. Three multiply handicapped children were involved in the study. Their ages ranged from 6 years to 9 years. Two of the children were diagnosed as having severe mental retardation as well as spastic quadriplegia. The third child was diagnosed as having severe-moderate mental retardation and spastic-athetoid quadriplegia. Reactive toys were defined as "those toys which when acted upon, temporarily sustain motion and/or produce auditory, visual, or tactile feedback" (Bambara et al., p. 143). Nonreactive toys were defined as having "limited potential to provide sensory feedback as a consequence of manipulation during the normal course of play" (Bambara et al., p. 143). The toys were selected for the study based on their ability to produce sustained movement and sound when manipulated and based on their ability to be converted to nonreactive toys. Six toys used in the study: a Slinky; a modified Slinky (coils were adhered together to make the slinky ridged); a Roly Poly Chime Ball; a modified Roly Poly Chime Ball (chiming mechanism was removed and the four rocking animals were glued in place); a Melody Mike and modified Melody Mike (mouth of Melody Mike was glued shut to prevent access to

musical playing keys).

The methods involved presenting each child with a pair of toys (one reactive and one nonreactive from the same group), simultaneously, on a daily session. The three-toy pairs were presented in succession for three minute observation periods. Before each observation period, to encourage toy manipulation the children were prompted through a training sequence with the two toys that were to be used in the next observation period. Prompting involved modeling of toy play, verbal direction, and if necessary, physical assistance. The prompting sequence continued until each child was able to play independently for approximately 30 seconds. Following the instructional session, the two toys were placed in front of the child for 3 minutes. The instructor prompted each child to play with the toy by directing the child to look at the toy and by physically manipulating the toy for the student for 2 or 3 seconds. This enabled the child to visually attend to the toy. Each child was then instructed to play with the toy. During the observation period, two toy responses were recorded, manipulative activity and visual activity. A manipulative activity was recorded if the children placed their hands on the toy and produced a motor action or a series of gestures on the toys. Holding the toy stationary or resting hands on the toy was considered nonactive or nonmanipulative. Visual activity was recorded if the children orientated their head and eyes towards the toy while involved in manipulative activity. A time sampling method, three seconds to observe and three seconds to record, was used to observe the children's manipulative and visual activity.

The results of the study indicated that all three children manipulated the reactive toys for greater percentage of intervals than they manipulated the nonreactive toys. Only one child reacted with both reactive and nonreactive toys during every experimental session. The authors concluded that a functional relationship existed between toy reactivity and manipulative activity. Recommendations were made for

replications of the study to be conducted to compare the generalization of results across other multiple handicapped students with different toy play skills and with different toys that produce other types of sensory feedback. In conclusion, Bambara et al. recommended that educators should consider the reactivity of the toy, the age-appropriateness of the toy, and individual student preference for sensory feedback, prior to the selection of toys for their students.

Review of Research Designs

Teachers in special education are faced with the task of selecting appropriate methods of instruction to increase or decrease targeted skills in their students. As part of this selection process, teachers conduct research to test which methods are appropriate in teaching a variety of skills to their students. Research in special education relies on this process to assist in verifying the results of previous research (research replication) and to conduct new research. In group research designs, intersubject variability exists within each group because of individual differences between the subjects in each group. Therefore, inferential statistics are needed to determine if an effect exists within a group as a result of intervention and not as a result of individual diferences within subjects. These inferential statistics make it difficult to generalize results from a group average to specific individuals (Barlow & Hersen, 1984). Because teachers in special education are more interested in individual student results rather than group results, they use single subject research designs rather than group designs to conduct their research.

Single subject research designs. A variety of single subject research designs are available to teachers for implementation of interventions with their students. Research designs include withdrawal and reversal, multiple baseline, and comparative designs. The following is a brief descriptions of the withdrawal and reversal design followed by a more detailed analysis of a comparative design, the alternating treatment design. The

alternating treatment design was chosen research design for this study.

Withdrawal and reversal designs involve variations of the basic *A-B* design. "*A*" represents a dependent variable measured repeatedly during a base-line period (e.g., the number of occurrences of recorded out-of-seat behavior is calculated over several sessions), and "*B*" represents the intervention (independent variable) applied to modify the dependent variable (e.g., the introduction of differential reinforcement (independent variable) for in-seat behavior (dependent variable). After obtaining a stable base-rate and after introducing a intervention, researchers often withdraw or reverse the intervention to see if the student's behavior will return to base-rate levels. If the student's behavior (after the withdrawal of intervention) approximates original base-rate levels, there is a greater likelihood that the intervention was responsible for the observed change in the independent variable. Researchers may repeat this process (*A-B-A-B*) to increase the validity of the design. The more replications demonstrating the observed change in the dependent variable, the greater the probability that the intervention was responsible for the change (Tawney & Gast, 1984).

Alternating treatment design. An alternating treatment paradigm is a comparative intervention design which enables the researcher to "compare the effects of two or more interventions across one or more learners and/or one or more behaviors" (Tawney & Gast, 1984, p. 300). For example, the researcher may want to compare the effectiveness of a time-out procedure (*B*) and an overcorrection procedure (*C*) for decreasing the student's inappropriate behavior of throwing toys. Baseline data (*A*) is collected (this is optional) and the interventions (*B* and *C*) are rapidly alternated according to a prearranged counterbalanced schedule. Researchers may continue the baseline throughout the intervention phase to compare *A* to *B* or *A* to *C*. Researchers also have the option of periodically conducting generalization probes rather than continuing the baseline throughout the sessions. The alternation of conditions is continued until one intervention has demonstrated a greater degree of effectiveness over

the other intervention. In addition, researchers have the option of continuing with the more effective intervention during the final phase of research.

Prior to implementing the design, researchers must operationally define all intervention procedures (e.g., operationally define throwing of objects, timeout and overcorrection procedures, data collection procedures, etc.). Researchers must also counterbalance the presentation of the interventions. For example, researchers should randomize which intervention will be used first (e.g., first occurrence of throwing behavior - timeout; second occurrence - overcorrection; third occurrence - timeout; fourth occurrence - overcorrection; fifth occurrence - overcorrection; sixth occurrence - timeout; seventh occurrence - timeout; eighth occurrence - overcorrection; etc.). However, when randomizing the order of interventions, researchers should ensure that they do not administer too many treatments consecutively. To prevent this from occurring, an upper limit should be placed on the number of times a treatment could be administered consecutively based on total number of alternations (Barlow & Hensen 1984). In addition to the counterbalancing of intervention, other extraneous factors must be alternated randomly depending on the procedures used within the intervention. For example, if more than one instructor is being used to carry out the interventions, researchers must randomize the procedures that each instructor will carry out and the interval at which instructors implement procedures. This randomization reduces the possibility of producing changes in student behavior as a result of working with one particular instructor over another. Other procedures, such as various settings, activities and time of day in which the interventions will be carried out, should also be counterbalanced or randomized.

i) Analysis of results. To determine which intervention method is more effective, each intervention studied (e.g., *B* and *C*) are graphed separately and the magnitude of the differences between the experimental conditions are determined. The magnitude of

the difference is determined by examining the vertical distance between the data paths of the conditions being compared. "The greater the vertical distance between the trend lines, the greater the difference between experimental conditions" (Tawney & Gast, 1984, p. 313). If there is overlap between the two interventions, there is less evidence of experimental effect.

ii) Advantages. The alternating treatment design has several advantages that overcome some of the shortcomings associated with other single subject designs. Tawney and Gast (1984) have summarized these advantages.

1. Baseline interventions are not a requirement of the alternating treatment design. Because baseline is not required, valuable time is saved and the risks of increasing inappropriate behaviors due to a prolonged baseline is reduced.

2. Unlike the reversal and withdrawal designs, alternating treatment designs do not require withdrawal of the interventions to demonstrate experimental control. Researchers may find it unethical to withdraw an intervention when self-abusive or aggressive behaviors are involved.

3. Because of the rapid alternation of interventions in the alternating treatment designs, researchers are able to separate the effects of a single component of an intervention package. This separation of effects is not always possible in a reversal or withdrawal design where historical factors (e.g., maturation, sickness) affect the retrieval of baseline levels and confound internal validity. Also, if two treatments are combined (e.g., as in a variation of the reversal and withdrawal design) it is not possible to separate out the individual contribution of each procedure.

4. If a researcher is confronted with time constraints, termination of the study early is less critical in a alternating treatment design than in other treatment designs where reaching criterion levels is an important goal. In the alternating

treatment design, intervention effects are typically evident early in the investigation.

iii) Limitations. Like other single subject research designs, their are limitations within the alternating treatment design:

1. Because two treatment procedures are rapidly alternated within the alternating treatment design by various administrators, a high level of procedural reliability is required (Tawney & Gast, 1984).

2. The rapid alternation of two interventions is somewhat artificial when compared to 'typical' procedures carried out in the classroom environment.

3. Randomizing or counterbalancing all of the procedures may be a cumbersome task.

4. "The multiple treatment interference (ie: the influence one intervention has on the apparent effectiveness of a second intervention) cannot be easily determined" (Tawney & Gast, 1984, p. 318).

5. A sequential effect (or order effect) can occur when the treatment in one phase is confounded by the effects of the previous treatment. For example, a treatment *B* may only have positive effects because it occurs after treatment *A*. However, this can be controlled by rapidly randomizing the treatments and presenting each treatment briefly (Barlow & Hensen, 1984).

6. A carry-over effect can be caused by the influence of one treatment on adjacent treatments, regardless of sequence. These effects are usually temporary and are most often due to the student's inability to discriminate between the two treatments. Therefore, in addition to rapidly alternating the treatments daily, different discriminitive stimuli should be associated with each treatment and only one treatment should be present per session. Once discriminations are learned, carry-over effects usually disappear (Barlow and Hensen, 1984).

7. Occasionally a change in the dependent variable is masked because the change is not maintained throughout the comparison phase of the study (Tawney & Gast, 1984).

Each of the various single subject research designs has its own advantages and limitations. The selection of one design over another depends on several factors. For example, researchers must consider whether or not reversal or withdrawal is possible. Another consideration is the availability of similar yet independent subjects, behaviors and/or conditions. In addition, researchers should keep in mind constraints and the intent of their research (e.g., if the intent is to compare interventions, a comparative design would seem most appropriate). The intent of the present study was to compare two methods of stimulus control in the enhancement of play skills with severely handicapped students; therefore the alternating treatment design was selected as the research design of choice.

Chapter III

STATEMENT OF THE PROBLEM

Problem. Controversy still exists over which teaching procedures are most effective in enhancing independent play skills during the acquisition and generalization phases of training severely handicapped students. In the following study, the effectiveness was tested of an increasing assistance model of prompting, coupled with reinforcement of appropriate play responses in the acquisition and generalization of play skills. Within the increasing assistance model of instruction, gestural prompts assisted in focusing the students' attention to the discriminitive features of the toys and physical prompts assisted the students in making the appropriate physical response with each toy.

Within the increasing assistance model, two methods of stimulus control were compared to determine which was more effective in (a) the acquisition of play skills during play training sessions and (b) the generalization of play skills from play training sessions to free play sessions. Each method (Table 1) consisted of a baseline phase (*A*), an acquisition phase (*B* and *E*), a generalization phase (*C* and *F*), and a free play phase (*D* and *G*). In Method 1, the acquisition phase (*B*) involved an increasing assistance method of prompting combined with a fixed interval reinforcement schedule for appropriate play. In the generalization phase (*C*), there was no prompting and a varied interval schedule was used to reinforce appropriate play. During the free play session (*D*), there was no prompting and no reinforcement of appropriate play. In Method 2, the acquisition phase (*E*) involved an increasing assistance method of prompting combined with a fixed interval reinforcement schedule for appropriate play. However, an auditory cue was heard by the student prior to the administration of each reinforcer. During the generalization phase (*F*), there was no prompting and a varied interval schedule was used to reinforce appropriate play. However, the auditory cue

Table 1. Phases of the study

Instructional Method	Baseline	Acquisition	Generalization	Free Play
1	*A*	*B*	*C*	*D*
		Increasing assistance prompting	No prompting	No prompting
		Fixed Interval reinforcement	Varied interval reinforcement	No reinforcement
		No auditory cue	No auditory Cue	No auditory cue
2	*A*	*E*	*F*	*G*
		Increasing assistance prompting	No prompting	No prompting
		Fixed interval reinforcement	Varied interval reinforcement	No reinforcement
		Auditory cue prior to reinforcement	Auditory cue continued on a fixed interval	Auditory cue continued on a fixed interval

was continued on a fixed interval schedule. During the free play phase (*G*) in Method 2, there was no prompting or reinforcement of appropriate play, however an auditory cue was continued on a fixed interval schedule.

Hypotheses

Hypotheses comparing acquisition phase to base-rate:

1. The use of increasing assistance procedure in condition *B* will result in more appropriate toy play responses during condition *B* than during the base-rate period *A*.

2. The use of increasing assistance procedure in condition *E* will result in more appropriate toy play responses during condition *E* than during the base-rate period *A*.

Rationale. The increasing assistance method of instruction will draw the students' attention to the discriminitive stimuli of the toys (indicating how and when to respond) and will assist the students in making the desired response. In addition, reinforcing the students for their responses in the presence of the naturally occurring stimuli during *B* and *E* will increase the probability that the students' responses will be repeated in the future.

The occurrence of the auditory cue during *E* prior to administration of reinforcement will serve as a discriminitive stimulus for the student to play appropriately with the toy to obtain reinforcement. In addition to the discriminitive features of the toy, the auditory cue will become a conditioned discriminitive stimulus for appropriate responses.

Hypotheses comparing instructional methods 1 and 2:

3. There will be no difference between conditions *B* and *E* with respect to the number of appropriate toy play responses .

4. Condition *F* will have a longer duration of appropriate toy play responses

than condition *C*.

5. Condition *F* will have fewer inappropriate behaviors than in condition *C*.

6. Condition *F* will have more level one appropriate toy play responses than condition *C*.

7. Condition *F* will have more level two appropriate toy play responses than condition *C*.

8. Condition *G* will have a longer duration of appropriate toy play responses than condition *D*.

9. Condition *G* will have fewer inappropriate behaviors than in condition *D*.

10. Condition *G* will have more level one appropriate toy play responses than condition *D*.

11. Condition *G* will have more level two appropriate toy play responses than condition *D*.

12. Condition *G* will have more level one and level two appropriate toy play responses combined than in condition *D*.

Rationale. Number of inappropriate behaviors will decrease in conditions *C*, *D*, *F*, and *G* because the students will have been receiving positive reinforcement for appropriate toy play during conditions *B* and *E*. Therefore, in order to obtain desired positive reinforcement, the students' number and duration of appropriate toy play responses (level one and two) will increase, while the number of inappropriate behaviors will decrease. In addition, the auditory cue, having been frequently associated with reinforcement for toy play in condition *E*, will act as a discriminitive stimulus for appropriate toy play during conditions *E*, *F* and *G* and will enhance the transfer of skills from conditions *E* to *F* and *G*. Therefore, during conditions *F* and *G* the students will have an additional cue to toy play which will result in conditions *F* and *G* having more level one and level two appropriate toy play

responses, longer durations of appropriate toy play responses and fewer inappropriate behaviors than in conditions *C* and *D*.

Methods and Procedures

Subjects. Four students were chosen for this study, fictitious names are used to label each subject. Nancy was diagnosed as having Down's syndrome resulting in moderate mental retardation with an I.Q between 40 and 55. Irene, Anne, and Andrew were all diagnosed as having severe mental retardation with I.Q.'s between 25 and 40. At the time of the study, the students' ages ranged from 5 years 4 months to 7 years 9 months (Andrew was 5 years 4 months, Nancy was 5 years 7 months, Anne was 5 years 10 months, and Irene was 7 years 9 months). All students were classmates in a special needs classroom. Each student was chosen on the basis of entry skills required to play with each of the toys selected for this study. Entry level skills included: head and trunk control, ability to hold a stable position, sufficient vision to discriminate between shapes that are 1.5 centimeters long by 1.5 centimeters wide, sufficient fine motor control to pick up, hold, pull, push and slide various items on the three toys (the most difficult fine motor task was the ability to place a 0.2 centimeter wide reel into or out of a 0.2 centimeter wide slot), sufficient eye-hand coordination to place small shapes into a similar shaped receptacle and to push a colored lense after being given a visual/auditory cue, and sufficient strength to pull down levers and panels, activate buttons and turn a dial with a spring coil. Table 2 describes the individual characteristics of each student.

Setting. The baseline and intervention (phases *A* through *G*) took place in the students' play center located within their classroom at Broxton Park Elementary School in Spruce Grove, Alberta. The play center consisted of an area partitioned off from the rest of the classroom by 3 dividers. The students could not see activities taking place in the classroom but could hear various activities. Shelves with toys were located in the

Student	Age	Mental Handicap	Communication Skills		Fine Motor Skills
			Expressive	Receptive	
Nancy	5 years 7 months	Moderate Mental Handicap	Uses one or two word phrases. Speech difficult to understand. Pairs some speech with signs (American Sign Language). Uses 25 different signs.	Carries out simple requests and directions that involve more than one response.	Prefers to use whole hand hand grasp, although will use pincer grasp when prompted.
Andrew	6 years 4 months	Severe Mental Handicap	Echoalic - will repeat words given a model. When prompted will request various preferred items in the environment (eg., "want milk").	Will carry out simple one word requests (eg.,"stand up", "come here"). Requires assistance with most directions.	Uses whole hand grasp.
Irene	7 years 9 months	Severe Mental Handicap	Uses approximately 10 signs (American Sign Language) to communicate her needs. No recognizable speech.	Will carry out simple one-word requests. Performance varies with motivation level. Requires assistance with most directions.	Slight paralysis of right side of body, affecting fine motor skills. Uses left hand only.
Anne	5 years 10 months	Severe Mental Handicap	Expresses herself verbally. Has approximately 5 functional words in repertoire.	Will carry out simple requests and directions that involve more than one response.	Prefers using whole hand grasp.

Table 2. Individual characteristics of the four students in this study.

play center. A door inside the play center lead to the playground and one wall of the play center consisted of windows looking onto the school playground. There were no tables or chairs inside the play center. The floor of the center was covered by a rug and the students sat on the floor to play with their toys. Prior to the study, play equipment such as tables, chairs and various toys were available in the play center. Once the study commenced, these items were removed to obtain accurate baseline levels of the students' play behaviors with selected toys.

Materials. Three toys were chosen for the play sessions based on the reactivity of the toys, general knowledge of the students' preference for various types of toys, and the age-appropriateness of the toys. In addition, a survey was sent to each student's home after the selection of the toys. Results from the survey indicated that none of the students had played with these toys on previous occasions. The toys included: 'Simon' by Milton Bradley, 'Perfection' by Lakeside and a 'View-Master' by View-Master International. The reactivity of toys increases the likelihood that students will interact with them; therefore, each of these toys had visual and auditory reactive components. The 'Simon' game cued the students by lighting up (visual reactive component) and by giving a corresponding tone (auditory reactive component) for each button to indicate the order in which the buttons were to be pressed. Each button also lit up and gave a tone after it had been pressed. The timer on the 'Perfection' game made a ticking sound and rotated when it was turned to the on position (auditory reactive component). The tray also popped up (visual reactive component) when timer completed its rotation. In addition, the 'View-Master' changed pictures (visual reactive component) and made a clicking sound (auditory reactive component) when the lever was pulled down.

The three games also contained elements that had been identified as reinforcing for the students in other activities. For example, all four students enjoyed looking at

photographs in books and the 'View-Master' provided a similar reinforcing activity. Also, three out of the four students enjoyed assembling puzzles; the 'Perfection' game provided a similar activity, as puzzle pieces have to be placed into their corresponding locations to complete the game. In addition, all four students enjoyed playing with toys that had lights and or musical components to them (e.g., flashlights and toy pianos). The 'Simon' game offered similar reinforcement value because its buttons lit up like flashlights and each button made a noise after it was pressed.

Each of the three games fulfilled another important consideration when selecting play materials for severely handicapped children. That is, each toy was age appropriate both during the study and in the future. For example, the 'Simon' game was recommended for people of all ages. It also offers adjustable skill levels varying from easy to very difficult offering players the option to participate partially or completely. The 'View-Master' was also age appropriate for the students and the skills acquired from learning how to operate a 'View-Master' could easily be generalized to operating a portable hand held slide viewer. The 'Perfection game' is also recommended for children seven to twelve years of age, and an adult version of the game is available. For the purpose of this study, the Perfection game was adapted by blocking out all but six slots of the 25 slots. This made the discrimination between puzzle pieces easier because the students now only had to discriminate six rather than 25 pieces. Although adaptations to the game may not be appropriate when the students play with their nonhandicapped peers, the students will still be able to participate partially when playing the game. The adaptations could be removed once the student is able to play the game successfully with only six puzzle pieces present. It should also be mentioned that these three games could also be used during group activities to teach socialization skills such as turn-taking, sharing, and passing skills.

Other materials used in the study included a video cassette camera, video tapes,

video cassette recorder, television monitor, count down timer, stop watch, data sheets (see appendix A), 45 second reinforcement tapes, two Sony Walkman tape players, two sets of headphones, and a tape recorder.

Baseline Procedures. Four baselines per toy (twelve baselines per student) were conducted. During these baseline sessions, each student was seated on the floor in the middle of the play center. One of the three toys was placed on the floor in front of the student, who was then given a verbal prompt to play with the toy. The instructor then left the play center and sat out of sight on a chair just outside the play center behind the divider. The student was then videotaped for seven minutes while playing with the toy. Two weeks prior to implementation of the baseline, the video recorder was brought into the classroom and staff members pretended to video tape the students during the students' play activities. This activity was designed to desensitize the students to the video recorder during the study and reduced the influence of the video recorder on student play behavior. The instructor did not intervene during the baseline session unless the student attempted to leave the play center or unless the student attempted to hurt themselves or damage property. If any of these two behaviors occurred, the student was redirected by the instructor. Redirection involved having the instructor come from behind the divider and direct the student to sit in the center of the play centre, the toy was then placed on the floor in front of the student and the instructor readministered a verbal prompt to play with the toy.

Seven minute baseline sessions were chosen because this length corresponded with the length of later generalization and free play phases of the study. Similar lengths of phases simplified comparisons between the conditions. Data collection during the baseline sessions involved recording the frequency and durations of appropriate play behavior of the students, classifying play behaviors as level one or two (discussed below), and counting the number of targeted inappropriate behaviors.

Appropriate play was defined as playing with a toy in the way in which it was intended. When appropriate play occurred, the recorder would place a check mark beside the corresponding step on the data sheet that described this behavior. For example, if the student playing with the 'Perfection' game pushed the tray down and turned on the timer, the recorder would place a check mark beside each of these steps on the data sheet. When an appropriate play behavior occurred, the recorder classified these behaviors as either level one or level two. Level two play behavior was assigned to the behaviors if the student linked the steps in proper order. For example, if the student pushed the tray down on the perfection game, turned the timer to the maximum level, pressed the switch to the on position and then proceeded to pick up the puzzle pieces and put them in the game, these steps would be classified at level two because they were carried out in the proper sequence. The student had to link together two or more steps before they could be classified as level two. If the student randomly performed a variety of steps in an illogical order - the student picked up a puzzle piece, placed it on the ground and repeatedly turned the switch on and off - the steps would be classified as level one. A step was also classified as level one if it was performed incorrectly. For example, if the student picked up three puzzle pieces and placed two of them in their correct location but incorrectly placed the third piece, a level two would be assigned to all steps except for the step in which the puzzle piece was incorrectly placed.

Recording the *total duration* of appropriate play behavior involved setting a count down timer according to the length of the session (i.e., seven minutes). The data collector then recorded the start and stop times of appropriate play. When the student ceased playing appropriately with the toy, the data collector conducted an event recording of inappropriate behaviors. That is, they counted the number of each student's inappropriate behaviors by placing a tick mark beside each targeted

inappropriate behavior on the data sheet every time the behavior occurred. Targeted inappropriate behaviors identified during base-rate data collection were specific to each individual. Andrew displayed six main categories of inappropriate behaviors: head-weaving (e.g., the rapid moving of the head from side to side), hand-flapping (e.g., rapidly flapping one or two hands up and down a minimum of three times), masturbation (e.g., rubbing the genital area against the floor or any object), aggressive behaviors (e.g.,biting, pinching, kicking or pushing others) and stimulation (e.g., rapidly moving any object up and down or side to side at eye level). Anne displayed one main category of inappropriate behavior, labelled as destructive (e.g., causing damage to other objects, throwing toys, peeling paper off toys, or placing toys in mouth and biting them). Irene's inappropriate behaviors included: Stimulation (bringing together of fingers and the thumb and releasing them in a quick repetitive motion, this stimulation may or may not be done against another object), self-abuse (e.g., hitting head with one hand or two, banging head against the wall, floor or any other object), spinning (e.g., while standing, turning body in a complete circle at least twice), crying (minimum of 3 seconds), and sleeping (closing eyes for more than 3 seconds during an instructional activity). Nancy displayed two main categories of inappropriate behaviors: Destructive behaviors (e.g., throwing objects, hitting objects with hand or other objects, stepping on or kicking objects) and spitting (e.g., spitting on objects - windows, floors, toys - or at other people).

Experimental procedures. An alternating treatment design was used during the intervention stages of the study. Two treatments were administered daily over 15 days (Table 3). These treatments were randomly alternated and counterbalanced with each student session by session. A semi-random order with an upper limit of three was used to ensure that a treatment would not be administered more than three times consecutively. Because instruction was carried out between 9:30 a.m. and 11:30 a.m., and between 12:50 p.m. and 2:20 p.m., the time of day interventions were

Session	Toy sequence	Andrew Instructor & Method		Anne Instructor & Method		Irene Instructor & Method		Nancy Instructor & Method	
1	SPV	T-1	M-2	T-2	M-2	T-1	M-1	T-1	M-1
2	PSV	T-2	M-2	T-1	M-2	T-2	M-1	T-2	M-2
3	PVS	T-1	M-2	T-2	M-2	T-2	M-1	T-1	M-1
4	SVP	T-1	M-1	T-2	M-1	T-2	M-2	T-1	M-2
5	VPS	T-2	M-1	T-2	M-1	T-1	M-2	T-2	M-1
6	SPV	T-1	M-2	T-1	M-1	T-1	M-2	T-1	M-1
7	VSP	T-1	M-1	T-2	M-2	T-1	M-1	T-2	M-2
8	PVS	T-2	M-2	T-1	M-1	T-2	M-2	T-1	M-2
9	SVP	T-2	M-1	T-1	M-2	T-1	M-1	T-1	M-2
10	SPV	T-1	M-2	T-1	M-1	T-2	M-2	T-2	M-1
11	VSP	T-1	M-2	T-2	M-1	T-1	M-2	T-1	M-1
12	PSV	T-1	M-1	T-2	M-1	T-2	M-2	T-2	M-2
13	VPS	T-2	M-2	T-1	M-2	T-1	M-1	T-2	M-2
14	PVS	T-2	M-1	T-2	M-2	T-2	M-1	T-1	M-1
15	VPS	T-1	M-1	T-1	M-1	T-2	M-2	T-2	M-2
16	SPV	T-2	M-2	T-1	M-2	T-2	M-1	T-1	M-1
17	PVS	T-2	M-1	T-2	M-1	T-1	M-2	T-2	M-2
18	SPV	T-1	M-1	T-1	M-2	T-2	M-1	T-2	M-1
19	VSP	T-2	M-1	T-1	M-1	T-1	M-2	T-1	M-1
20	PVS	T-1	M-2	T-2	M-2	T-1	M-1	T-2	M-2
21	PSV	T-1	M-2	T-2	M-2	T-2	M-1	T-1	M-2
22	VSP	T-2	M-2	T-2	M-1	T-1	M-2	T-1	M-1
23	SVP	T-2	M-1	T-1	M-1	T-1	M-2	T-2	M-1
24	PSV	T-2	M-1	T-1	M-2	T-2	M-1	T-1	M-2
25	VPS	T-1	M-2	T-2	M-2	T-2	M-1	T-2	M-1
26	SVP	T-1	M-1	T-2	M-1	T-1	M-2	T-2	M-1
27	PSV	T-2	M-2	T-1	M-2	T-1	M-1	T-2	M-2
28	VPS	T-2	M-1	T-1	M-1	T-2	M-2	T-1	M-2
29	PSV	T-1	M-1	T-2	M-1	T-2	M-2	T-1	M-1
30	VPS	T-2	M-2	T-1	M-2	T-1	M-1	T-2	M-2

Table 3. Counterbalancing schedules of the toy seqence, instructors and interventions in the study. Note: S = Simon game,P= Perfection game, V = View-Master game, T-1 = instructor one, T-2 = instructor two, M-1 = Method (intervention) 1, M-2=Method (intervention) 2.

administered was randomly alternated across a.m. and p.m. sessions. Similarily, the order in which students received instruction (i.e., first, second, third, and fourth) was also randomly alternated across the a.m. and p.m. sessions. Other factors that were counterbalanced included the random alteration of the two instructors administering the interventions, and the sequence of toys presented to the students for instruction during the second phase of the study.

Instructional Method 1 consisted of an acquisition phase (*B*), a generalization phase (*C*) and a free play phase (*D*). Instructional Method 2 also consisted of an acquisition phase (*E*), a generalization phase (*F*) and a free play phase (*G*). During acquisition phases (*B* and *E*), an increasing assistance method of instruction was used to prompt the students through the entire task analyses - *total task chaining method* - of the three toys. The prompt hierarchy used in this study began with the presentation of the natural cue (e.g., 'Simon' game is placed in front of student), followed by a verbal prompt (e.g., "Turn on the game"), a gestural prompt combined with the verbal prompt (e.g., instructor pointed to the start button and repeated the verbal cue "Turn on Simon"), and physical assistance combined with the verbal prompt (e.g., instructor placed the student's finger on the start button and slid the button to the *on* position and repeated the verbal prompt). The instructor began with the least intrusive prompt, the presentation of the natural cue, and waited two seconds for a response. If the student did not respond, the instructor went on to the next least intrusive response prompt. Latency intervals of 2 seconds were inserted between each successive prompt level. The instructor verbally reinforced the student after the completion of each step in the sequence of steps required to play with each toy. Once the student began completing a step at a less intrusive response level, the student was no longer reinforced on those occasions when they required more intrusive prompts; rather, the instructor provided the students with negative feedback (e.g., "No") and the instructor moved on to the

next prompt level in the hierarchy until the student was able to complete the task. For example, if, during the second and third session, the student turned on the switch given a verbal cue but the student did not respond when given the same cue in the fourth session, the instructor would consequate this verbal cue with "No!" before moving on to the next level in the prompt hierarchy. "No" was also administered if the student was unable to complete a step when provided with full physical reinforcement. For example, if a student resisted full physical assistance by pushing away from the instructor or if the student exhibited a negative behavior such as striking the instructor during the administration of full physical assistance, the instructor provided the student with negative feedback. The instructor prompted the student through all three task analyses for the three toys during each session.

Two staff members were required during the acquisition phase of the study. One staff member instructed the student while the other staff member recorded data. Data collection involved recording the prompt level that the student required on each step in the task analyses, recording the occurrences of inappropriate behaviors and the administration of reinforcement. When the instructor began the session, the data collector started a stop watch in order to determine the length of time required to prompt the student through all three task analyses. For each step of the task analyses, the data collector marked on the data sheet a *N* when the student responded to the natural discriminitive stimuli of the toy, a *V* when the student required a verbal prompt, a *G* when the student required a gestural prompt, and a *P* when the student required a physical prompt. As in the baseline procedures, the data collector also recorded any occurrences of inappropriate behaviors. The same recording procedure was used to record inappropriate behaviors during the acquisition phase as in the baseline phase. The recording of administration of reinforcement involved checking off whether or not the student earned reinforcement at the sound of the tone. Reinforcement was

administered to the student on a fixed interval schedule every 45 seconds. At the sound of the tone the student was reinforced if no inappropriate behavior was occurring. Only the behavior occurring at the sound of the tone was taken into consideration. Reinforcement included verbal praise and physical reinforcement (e.g., "Great playing" combined with a rub on the back). A 45 second schedule of reinforcement was optimal for all students (e.g., it was geared towards the student with the lowest level of appropriate play responses) and was functional and manageable for the instructor. In the acquisition phase *B* (method 1), the tone was only audible to the instructor and data collector through two sets of headphones attached to a tape recorder. During the acquisition phase *E* (method 2), the student was able to hear the tone.

The generalization phases (*C* and *F*) immediately followed the acquisition phases of instruction. These phases were seven minutes in length. All generalization phases were video taped for exactly seven minutes. At the beginning of the generalization sessions, the instructor sat the student in the middle of the play center with the three toys, placed the toys equal distance from the student and gave the student a verbal prompt to play with the toys. The instructor sat in front of the play center on a chair and was visible by the student. During these sessions, the instructor reinforced the student on a varied 45-second schedule of reinforcement for appropriate behavior (in the absence of inappropriate behaviors). During the seven minutes, nine intervals of reinforcement were possible, but reinforcement was available on only 5 out of the 9 intervals. This allowed for the varied intervals of reinforcement. Which 5 intervals were selected for reinforcement were randomized from session to session. For example, during session one, the students had the opportunity to earn reinforcement during the second, third, fifth, seventh and ninth intervals. During the second session, the students had the opportunity to earn reinforcement during the first, fourth, sixth, seventh and ninth session and so on. These intervals were selected systematically prior

to the implementation of the study. Reinforcement was administered at the sound of the tone and the student was reinforced for playing appropriately with the toy in the absence of inappropriate behaviors. The instructor took into consideration only those behaviors that the student was exhibiting at the sound of the tone. Therefore, if the student was not playing appropriately with the toy at the sound of the tone, the student was not reinforced. During generalization phase *C* (Method 1), the tone was audible only to the instructor through a set of headphones. During generalization phase *F* (Method 2), the tone was audible to both the student and the instructor and was continued on a fixed interval schedule.

Free play sessions (*D* and *G*) were conducted in a manner similar to the baseline and generalization sessions. The student was seated in the middle of the play center and instructed to play with the three toys. But, as in the baseline sessions, the instructor left the play center and sat in a chair out of sight behind the play center divider. The instructor did not intervene unless a student was in danger of hurting themselves or damaging items in the play center. During both sessions (*D* and *G*), the student was not reinforced by the instructor for playing appropriately with the toys. However, during Method 2 the 45 second reinforcement tape was continued from the generalization phase and the students could still hear a tone every 45 seconds.

Each generalization and free play phase of the study was video-taped. Data collection during these phases was identical to data collected during the baseline phase. Data collection involved recording the appropriate play behavior of the students, monitoring the administration of reinforcement, classifying play behaviors as level one or two, calculating the duration of appropriate play, and conducting a number count of targeted inappropriate behaviors. The recording of appropriate play behaviors during the generalization phase was more complex than during the baseline phases because the students now had the opportunity to play with all three toys during one session. This

presentation of three toys at once involved having the data collector monitor three tasks during one session. As mentioned previously, during the baseline phase only one toy was given to the student per session. This procedure ensured an accurate recording of the students' baseline levels in playing with each of the three toys.

Staff training. In total, three people were used to assist in the collection of data during the study. Only two of the three staff members were involved with the direct instruction of the students. Prior to implementation of the study, the three staff members were trained by observing video tapes of students. These students were playing with the same sets of toys and had similar disabilities as the students participating in the study. The video tape was used to demonstrate the two intervention methods and to test each staff members' abilities to record data during the baseline, acquisition, generalization and free play phases. In general, staff members were trained and tested in observing and recording appropriate play behaviors, monitoring the administration of reinforcement, classifying play behaviors as level one or two, calculating the duration of appropriate play, and conducting a number count of targeted inappropriate behaviors. The two staff members involved in the instruction of the students had the opportunity to practice the increasing assistance method on each other, and on the students who appeared in the training video. The staff members were tested to ensure that they were able to administer the correct prompts in correct order, the appropriate delay interval between prompts, and the appropriate reinforcement, correction, and consequent procedures. Testing involved sampling ten of the instructor's prompts to the students per test session and scoring their instructions as either right of wrong. For example, if the instructor omitted a level in the prompt hierarchy, delayed too long before going on to the next step in the prompt hierarchy or reinforced a student when they should have given a consequence to the student, this would be scored as wrong by the observer. The instructors had to prompt the student correctly on 10 out of 10 trials before training and testing was considered complete.

Several interobserver reliability calculations were conducted throughout the study. Interobserver reliability checks were first conducted between staff members while collecting data during the test video. Interobserver reliability checks were also conducted during 12 of the baseline sessions (3 per student and one per toy) and during 28 out of the 106 (7 sessions per student) intervention sessions. The interobserver reliability checks were conducted throughout the acquisition, generalization and free play phases of the 28 sessions. The 28 sessions were selected prior to the implementation of the study in order to ensure that checks were conducted at the beginning, middle, and end of the study. During those sessions when reliability checks were to be conducted, the acquisition phase was video-taped along with the generalization and free play phases (as mentioned previously, to make data collection manageable all generalization and free play sessions were video taped). Each interobserver reliability calculation represented a "true case" because the true case (the original behaviors the students displayed) was first captured on videotape and then analyzed by two data collectors at separate times (Tawney & Gast, 1984). To ensure that the two data collectors were observing the same phases of the tapes, the first observer recorded the number on the tape counter when they first began observing the session on the tape and the number on the tape counter when the session was finished. The numbers of the tape counters indicating the location of each session were then given to the second data collector. In addition to the tape counter locations, a voice could be heard on the tape indicating the beginning and end of each session. In addition to synchronizing the data collectors, the voice and tape counter locations of each session were convenient to all three recorders because sometimes the data collectors had to observe a session two to three times to collect all the specified data. This procedure was especially true when a student displayed a high number of behaviors. Data collectors also set a count-down timer for the length of the session and

started the timer when observation and recording began. When a data collector recorded a behavior, the time on the count-down timer was also recorded in order to test whether the two data collectors were synchronized.

Interobserver reliability checks were conducted after the data collectors had completed recording data on an entire data sheet. Each data sheet was designed to provide information regarding the observation and recording of the acquisition, generalization, and free play phases of instruction. After the two data collectors had completed viewing and recording data during the three phases on the video, the data sheets were then compared, and one measure of interobserver reliability was calculated per data sheet.

In the acquisition section of the data sheet, prompt levels that the students required at each step in the sequence of steps for playing with each toy were compared. Agreements and disagreements were then totalled. The number of inappropriate behaviors were compared during this phase. The time of occurrence of these behaviors were also compared to ensure that the data collectors were synchronized in their observations. Again, agreements and disagreements were totalled.

In the generalization and free play sections, duration of appropriate play behavior, occurrence of play responses, and the number of inappropriate behaviors were compared. The analyses of the duration of appropriate behavior involved comparing the start and stop times that the data collectors had identified as the start and stop times for each appropriate toy play behavior or sequence of toy play behaviors. Agreements and disagreements were totalled. Comparisons of the occurrence of specific play behavior with each toy involved comparing the steps in the task analyses that were checked off by the data collectors, the time of occurrence of the steps (to verify that the observers were synchronized) and the classification of the performance as either level one or level two. If one data collector had checked off steps not identified by the other

data collector, this was considered a disagreement. If one data collector classified a step in the task analyses as level one and the other data collector classified the step as level two, this also was recorded as a disagreement. Agreements and disagreements were totalled. Comparisons of the occurrence of inappropriate behaviors involved comparing the ticks beside each identified inappropriate behavior and the time of occurrence of each behavior or group of behaviors (some behaviors occurred at too high a number, making the recording of the time of occurrence for each behavior impossible). If one data collector had recorded the occurrence of an inappropriate behavior and the other data collector had not, this would be considered a disagreement. Agreements and disagreements were again totalled. Once the totalling of agreements and disagreements for each section was complete, an interobserver reliability measure was calculated by multiplying the agreements by 100 and dividing by the number of agreements plus disagreements.

Interobserver reliability checks conducted on the twelve baseline sessions were completed in a similar manner. The duration of appropriate play behavior, occurrence of play responses and the number of inappropriate behaviors were recorded and compared with identical methods to those used in the generalization and free play phases. Again, one measure of reliability was calculated per baseline session.

Chapter IV

RESULTS

All students were present during the twelve baseline sessions. During the intervention sessions, Andrew was absent during 10 sessions, Anne during three sessions, Irene was absent during one session and Nancy was absent during two. As a result of these absences, Andrew received 10 sessions with training Method 1 (M-1) and 2 (M-2); Anne received 13 sessions with training M-1 and 14 sessions with training Method 2; Irene received 14 sessions with training M-1 and 15 sessions with training Method 2; and Nancy received 14 sessions of training M-1 and M-2.

The reliability of the baseline data collection ranged from 79% to 97% with a combined mean of 87%. The reliability of the intervention phases (*B, C, D, E, F* and *G*) ranged from 77% to 100% with a combined mean of 93%.

Figure 1 shows Andrew's appropriate play responses with the Perfection game during baseline (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 1

Since all of the following graphs are analyzed in the same manner, to provide a clear, concise, and consistent method of presenting the data, all information will be presented in a point-form format. Scale breaks in the figures indicates that the student was absent during those sessions.

1) Comparison of Andrew's Perfection (M-1) (Condition *B*) with Perfection baseline (*A*).

a) The mean of Perfection baseline (*A*) was 2.5 appropriate play responses (APR's).

b) The mean of the last four days of Perfection M-1 (*B*) was 16.7 APR's.

c) The difference between *B* and *A* was 14.2 APR'S.

d) The difference of 14.2 supports hypothesis 1 (*B* would have a greater

number of appropriate play responses than A). Although the data supports hypothesis 1, a causal relationship between the treatment and the increase in APR's cannot be infered because *AB* is a simple withdrawal design and the increase in APR's may be a result of other uncontrolled factors (such as maturation of the student) and not as a result of the treatment. For this reason, causal relationships cannot be inferred in any of the following analyses involving a comparison between levels of performance during base-rate and treatment conditions.

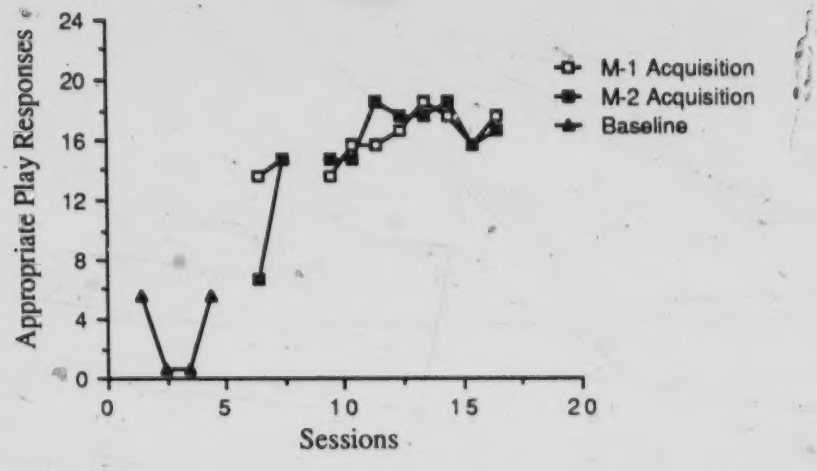


Figure 1. Andrew's appropriate play responses with the Perfection game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Andrew responded to the natural discriminitive stimuli during the sequence of steps for the Perfection game per session.

2) Comparison of Andrew's Perfection Method 2 (M-2) (*E*) with Perfection baseline (*A*).

a) The mean of Perfection baseline (*A*) was 2.5 APR's.

b) The mean of the last four days of Perfection M-2 (*E*) was 16.5 APR's.

c) The difference between *E* and *A* was 14.0 APR's.

d) The difference 14.0, supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*).

3) Trend analysis for Andrew Perfection M-1 (*B*).

a) Acceleration was observed during the first 7 treatments (sessions 6 to 13); the range was from a low of 13 APR's to a high of 18 APR's.

b) Variable deceleration was apparent during the last three treatments (sessions 14 to 16); the range was from a high of 18 APR's to a low of 16 APR's.

4) Trend analysis for Andrew Perfection M-2 (*E*).

a) Acceleration occurred during the first 4 treatments (sessions 6 to 10); the range was from a low of 6 APR's to a high of 18 APR's.

b) A horizontal trend was observed during the next four treatments (sessions 11 to 14), with a mean of 17.5 APR's.

c) Variable decelerating trend occurred during the last three treatments (sessions 14 to 16), range was from a high of 18 APR's to a low of 15 APR's.

5) Comparison of Andrew's Perfection M-1 (*B*) and Perfection M-2 (*E*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 4 points.

c) 4/10 M-1 data points are above M-2 data points.

d) 4/10 M-2 data points are above M-1 data points.

6) Conclusion for Andrew's acquisition phases Perfection M-1 (*B*) and Perfection M-2 (*E*).

There is no significant difference between the trend lines of Perfection M-1 and Perfection M-2 . Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 2 shows Andrew's appropriate play responses with the Simon game

during baseline (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

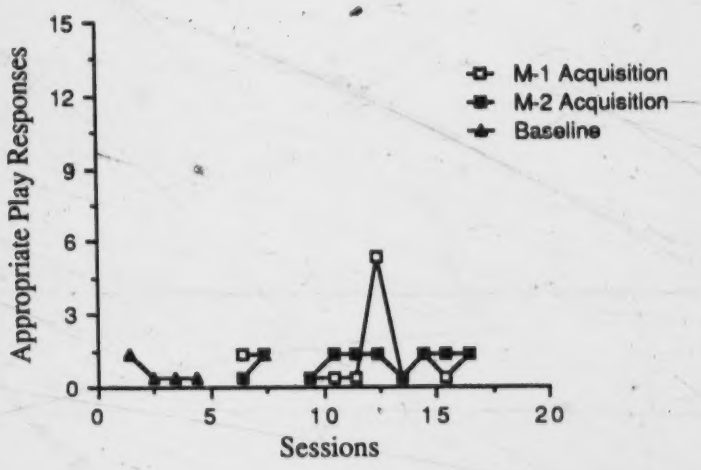


Figure 2. Andrew's appropriate play responses with the Simon game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Andrew responded to the natural discriminitive stimuli during the sequence of steps for the Simon game per session.

Analysis of Figure 2

1) Comparison of Andrew's Simon M-1 (*B*) with Simon baseline (*A*).

a) The mean of Simon baseline (*A*) was .25 APR's.

b) The mean of the last four days of Simon M-1 (*B*) was .5 APR's.

c) The difference between *B* and *A* was .25 APR'S.

d) There is no significant difference between Simon M-1 (*B*) and Simon (*A*), therefore hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition A) is not supported.

2) Comparison of Andrew's Simon M-2 (*E*) with Simon baseline (*A*).

a) The mean of Simon baseline (*A*) was .25 APR's.

b) The mean of the last four days of Simon M-2 (*E*) was .75 APR's.

c) The difference between *E* and *A* was .50 APR's.

d) There is no significant difference between Simon M-2 (E) and Simon baseline

(*A*), therefore hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*) is not supported.

3) Trend analysis for Andrew's Simon M-1 (*B*).

a) A general horizontal trend occurred throughout the 10 treatments (sessions 6 to 16) ranging between 1 and 0 APR's, with the exception of treatment 6 (session 12) which accelerated to a high of 5 APR's.

4) Trend analysis for Andrew's Simon M-2 (*E*).

a) A general horizontal trend occurred throughout the ten days of treatment (sessions 6 to 16) ranging between 1 and 0 APR's.

5) Comparison of Andrew's Simon M-1 (*B*) and Simon M-2 (*E*).

a) M-1 and M-2 coincide at 5 points.

b) M-1 and M-2 cross-over at 1 point.

c) 2/10 M-1 data points are above M-2 data points.

d) 3/10 M-2 data points are above M-1 data points.

6) Conclusion for Andrew's acquisition phases Simon M-1 (*B*) and Simon M-2 and (*E*).

There is no significant difference between the trend lines of Simon M-1 and Simon M-2. Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 3 shows Andrew's appropriate play responses with the View-Master game during baseline (Condition *A*) and acquisition phases of Method 1 (M-1) (Condition *B*) and Method 2 (M-2) (Condition *E*).

Analysis of Figure 3

1) Comparison of Andrew's View-Master M-1 (*B*) with View-Master base-rate (*A*).

a) The mean of View-Master base-rate (*A*) was 7.5 APR's.

b) The mean of the last four days of View-Master M-1 (*B*) was 24.5 APR's.

c) The difference between *B* and *A* was 17 APR'S.

d) The difference of 17 APR's supports hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition A).

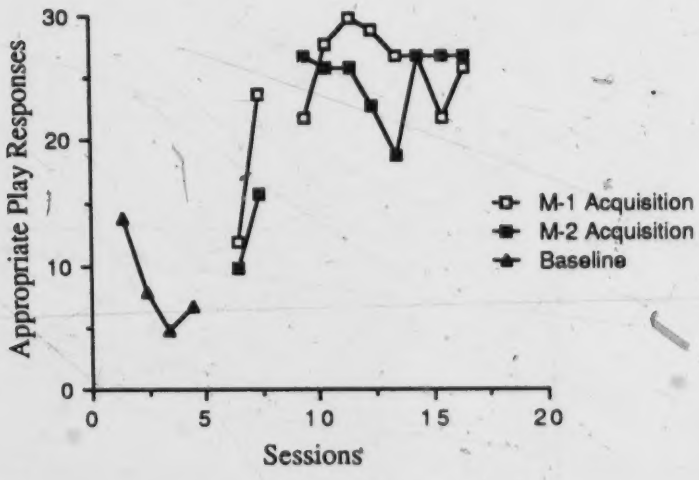


Figure 3. Andrew's appropriate play responses with the View-Master game during baseline (A) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Andrew responded to the natural discriminitive stimuli during the sequence of steps for the Simon game per session.

2) Comparison of Andrew's View-Master M-2 (*E*) with View-Master base-rate (*A*).

a) The mean of View-master baseline (*A*) was 7.5 APR's.

b) The mean of the last four days of View-Master M-2 (*E*) was 24 APR's.

c) The difference between *E* and *A* was 16.5 APR's.

d) The difference of 16.5 APR's, supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*).

3) Trend analysis for Andrew's View-Master M-1 (*B*).

a) An accelerating trend occurred during the first five treatments (sessions 6 to

11); the range was from a low of 11 APR's to a high of 29 APR's.

b) A decelerating trend was observed during treatments 5 to 9 (sessions 11 to 15); the range was from a high of 29 APR's to a low of 21 APR's.

c) An acceleration occurred from treatments 9 to 10 (sessions 15 to 16) from 21 APR's to 25 APR's.

4) Trend analysis for Andrew's View-Master M-2 (*E*).

a) An accelerating trend occurred over the first three treatments (sessions 6 to 9); the range was from a low of 9 APR's to a high of 26 APR's.

b) A decelerating trend was apparent over the next four treatments (sessions 10 to 13); the range was from a high of 25 APR's to a low of 18 APR's.

c) Treatment 8 (session 14) resulted in an acceleration from 18 APR's to 26 APR's.

d) The last three treatments (sessions 14 to 16) resulted in a horizontal trend at 26 APR's.

5) Comparison of Andrew's View-Master M-1 (*B*) and View-Master M-2 (*E*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 1 point.

c) 6/10 M-1 data points are above M-2 data points.

d) 3/10 M-2 data points are above M-1 data points.

6) Conclusion for Andrew's acquisition phases View-Master M-1 (*B*) and View-Master M-2 and (*E*).

Although six of the M-1 data points are above M-2, the magnitude of the difference between these data points is not significant. Therefore, there is no significant difference between the trend lines of Simon M-1 and Simon M-2. Hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 4 shows Anne's appropriate play responses with the Perfection game

during baseline (*A*) and acquisiton phases of Method 1 (*B*) and Method 2 (*E*)

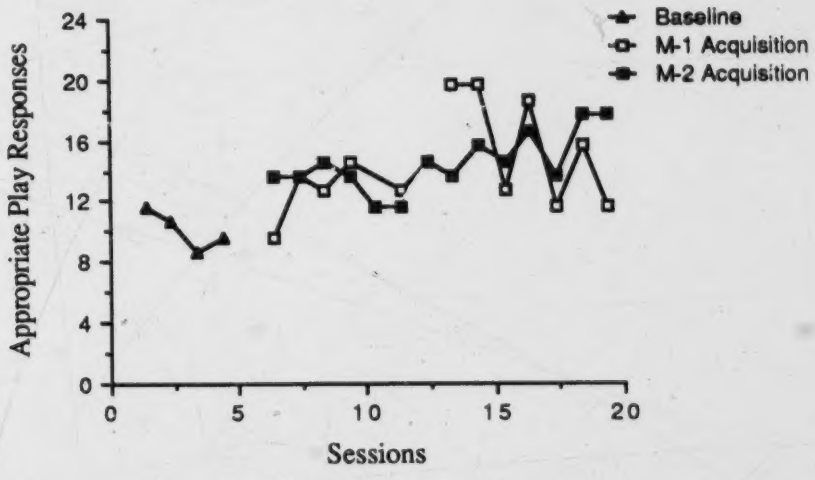


Figure 4. Anne's appropriate play responses with the Perfection game during baseline (A) and the acquisition phases of Method 1 (B) and Method 2 (E). Appropriate play responses equal the number of times Anne responded to the natural discriminitive stimuli during the sequence of steps for the Perfection game per session.

Analysis of Figure 4

1) Comparison of Anne's Perfection M-1 (*B*) with Perfection base-rate (*A*).

a) The mean of Perfection base-rate (*A*) was 9.5 APR's.

b) The mean of the last four days of Perfection M-1 (*B*) was 13.75 APR's.

c) The difference between *B* and *A* was 4.25 APR'S.

d) The difference of 4.25 APR's supports hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition A) .

2) Comparison of Anne's Perfection M-2 (*E*) with Perfection base-rate (*A*).

a) The mean of Perfection base-rate (*A*) was 9.5 APR's.

b) The mean of the last four days of Perfection M-2 (*E*) was 15.75 APR's.

c) The difference between *E* and *A* was 6.25 APR's.

d) The difference of 6.25 APR's supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than *A*).

3) Trend analysis for Anne's Perfection M-1 (*B*).

a) A variable accelerating trend was apparent during the first seven treatments (sessions 6 to 13); the range was from a low of 9 APR's to a high of 19 APR's.

b) Treatment 8 (session 14) remained at 19 and a widely fluctuating trend followed in treatments 9 to 13 (sessions 15 to 19); the range was from a low of 11 APR's to a high of 18 APR's. The mean was 13.4 APR's.

4) Trend analysis for Anne's Perfection M-2 (*E*).

a) A general horizontal trend occurred during the first four treatments (sessions 6 to 9); the range was from a high of 13 APR's to a low of 4 APR's.

b) Treatments four to six (sessions 9 to 11) resulted in a deceleration from 13 to 11 APR's.

c) The last eight treatments (sessions 12 to 19) resulted in a fluctuating acceleration; the range was from a low of 13 APR's to a high of 17 APR's..

5) Comparison of Anne's Perfection M-1 (*B*) and Perfection M-2 (*E*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 5points.

c) 4/13 M-1 data points are above M-2 data points.

d) 6/15 M-2 data points are above M-1 data points.

6) Conclusion for Anne's acquisition phases Perfection M-1 (*B*) and Perfection M-2 and (*E*).

There is no significant difference between the trend lines of Perfection M-1 and Perfection M-2. Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 5 shows Anne's appropriate play responses with the Simon game during base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

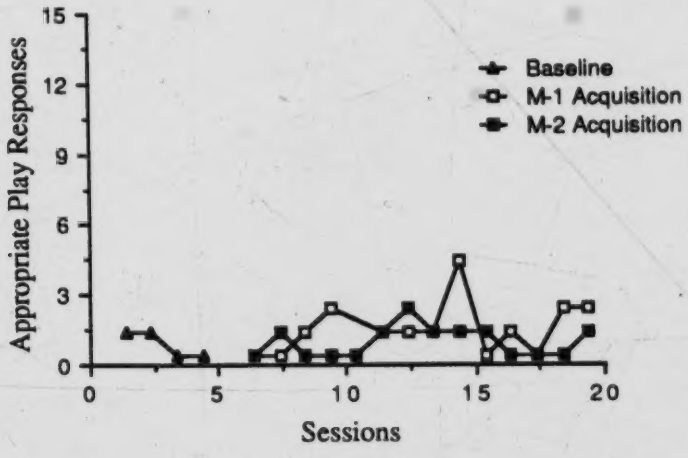


Figure 5. Anne's appropriate play responses with the Simon game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Anne responded to the natural discriminitive stimuli during the sequence of steps for the Simon game per session.

Analysis of Figure 5

1) Comparison of Anne's Simon Method 1 (*B*) with Simon base-rate (*A*).

a) The mean of Simon base-rate (*A*) was .5 (APR's).

b) The mean of the last four days of Simon M-1 (*B*) was 1.25 APR's.

c) The difference between *B* and *A* was .75 APR'S.

d) There is no significant difference between Simon M-1 (*B*) and Simon base-rate (*A*), therefore hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition A) is not supported.

2) Comparison of Anne's Simon M-2 (*E*) with Simon baseline (*A*).

a) The mean of Simon baseline (*A*) was .5 APR's.

b) The mean of the last four days of Simon M-2 (*E*) was .25 APR's.

c) The difference between *E* and *A* was .25 APR's.

d) There is no significant difference between Simon M-2 (E) and Simon base-rate (*A*), therefore hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*) is not supported.

3) Trend analysis for Anne's Simon M-1 (*B*).

a) A fluctuating horizontal trend occurred throughout the 13 treatments (sessions 6 to 19) ranging between 0 and 2 APR's, with the exception of treatment 8 (session 14) which accelerated to 4 APR's.

4) Trend analysis for Anne's Simon M-2 (*E*).

a) A general horizontal trend occurred throughout the fourteen days of treatment (sessions 6 to 19) ranging between 0 and 1 APR's, with the exception of an acceleration during treatment seven (session 12) from 1 APR to 2 APR's.

5) Comparison of Anne's Simon M-1 (*B*) and Simon M-2 (*E*).

a) M-1 and M-2 coincide at 4 points.

b) M-1 and M-2 cross-over at 3 points.

c) 4/13 M-1 data points are above M-2 data points.

d) 3/13 M-2 data points are above M-1 data points.

6) Conclusion for Anne's acquisition phases Simon M-1 (*B*) and Simon M-2 and (*E*).

There is no significant difference between the trend lines of Simon M-1 and Simon M-2. Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 6 shows Anne's appropriate play responses with the View-Master game during the base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 6

1) Comparison of Anne's View-Master M-1 (*B*) with View-Master base-rate (*A*).

a) The mean of View-Master base-rate (*A*) was 6.75 APR's.

b) The mean of the last four days of View-Master M-1 (*B*) was 14.5 APR's.

c) The difference between *B* and *A* was 7.75 APR'S.

d) The difference of 7.75 APR's supports hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition A).

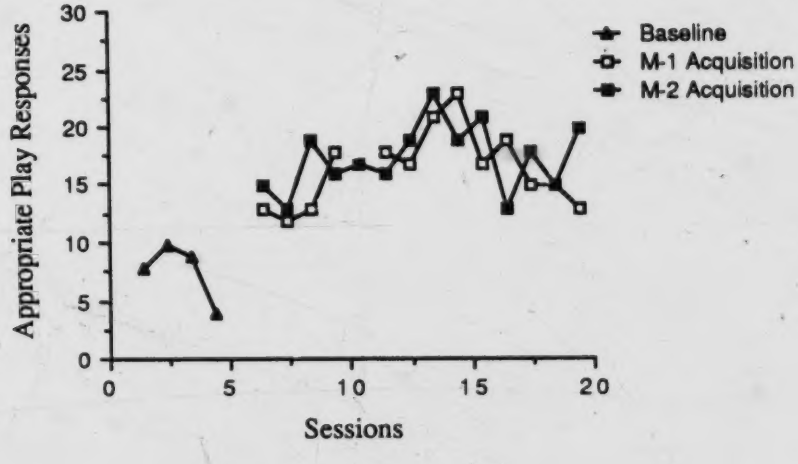


Figure 6. Anne's appropriate play responses with the View-Master game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Anne responded to the natural discriminitive stimuli during the sequence of steps for the View-Master game per session.

2) Comparison of Anne's View-Master M-2 (*E*) with View-Master base-rate (*A*).

a) The mean of View-Master base-rate (*A*) was 6.75 APR's.

b) The mean of the last four days of View-Master M-2 (*E*) was 15.5 APR's.

c) The difference between *E* and *A* was 8.75 APR's.

d) The difference of 8.75 APR's supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*).

3) Trend analysis for Anne's View-Master M-1 (*B*).

a) A variable accelerating trend occurred during the first 8 treatments (sessions 6 to 14); the range was from a low of 11 APR's to a high of 22 APR's.

b) A variable decelerating trend resulted during the following 5 treatments (sessions 15 to 19); the range was from a high of 18 APR's to a low of 12 APR's.

4) Trend analysis for Anne's View-Master M-2 (*E*).

a) A variable accelerating trend occurred during the first 8 treatments (sessions 6 to 13); the range was from a low of 12 APR's to a high of 22 APR's.

b) A variable decelerating trend occurred during the following 6 treatments (sessions 14 to 19); the range was from a high of 20 APR's to a low of 12 APR's.

5) Comparison of Anne's View-Master M-1 (*B*) and View-Master M-2 (*E*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 6 points.

c) 4/13 M-1 data points are above M-2 data points.

d) 8/13 M-2 data points are above M-1 data points.

6) Conclusion for Anne's acquisition phases View-Master M-1 (*B*) and View-Master M-2 and (*E*).

Although 8 data points of M-2 are over M-1, the magnitude of the difference between these data points were not significant. Therefore, there is no significant difference between the trend lines of View-Master M-1 and View-Master M-2. Hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 7 shows Irene's appropriate play responses with the Perfection game during the base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 7

1) Comparison of Irene's Perfection M-1 (*B*) with Perfection base-rate (*A*).

a) The mean of Perfection base-rate (*A*) was 0 APR's.

b) The mean of the last four days of Perfection M-1 (*B*) was 8 APR's.

c) The difference between *B* and *A* was 8 APR'S.

d) The difference of 8 APR's supports hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition *A*).

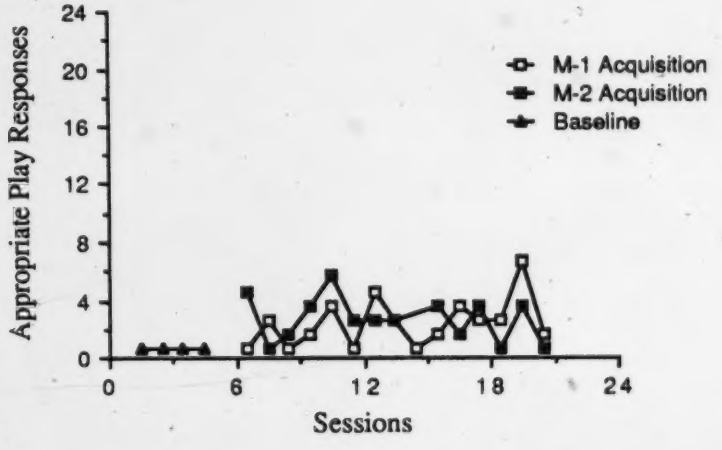


Figure 7. Irene's appropriate play responses with the Perfection game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Irene responded to the natural discriminitive stimuli during the sequence of steps for the Perfection game per session.

2) Comparison of Irene's Perfection M-2 (*E*) with Perfection base-rate (*A*).

a) The mean of Perfection base-rate (*A*) was 0 APR's.

b) The mean of the last four days of Perfection M-2 (*E*) was 1.5 APR's.

c) The difference between *E* and *A* was 1.5 APR's.

d) The difference of 1.5 APR's supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*).

3) Trend analysis for Irene's Perfection M-1 (*B*).

a) There was generally a horizontal trend throughout thirteen of the fifteen sessions; the range was from a low of 0 APR's to a high of 3 APR's.

b) Accelerations occurred during treatments 7 (session 12) and 14 (session 19) to 4 APR's and 6 APR's respectively.

4) Trend analysis for Irene's Perfection M-2 (*E*).

a) A general horizontal trend occurred throughout 13 of the 15 treatments; the range was from a low of 0 APR's to a high of 3 APR's.

b) Accelerations occurred during treatments 1 (session 6) and 5 (session 10) to 4 APR's and 5 APR's respectively.

5) Comparison of Irene's Perfection M-1 (*B*) and Perfection M-2 (*E*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 7 points.

c) 6/14 M-1 data points are above M-2 data points.

d) 7/14 M-2 data points are above M-1 data points.

6) Conclusion for Irene's acquisition phases Perfection M-1 (*B*) and Perfection M-2 (*E*).

There is no significant difference between the trend lines of Perfection M-1 and Perfection M-2. Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 8 shows Irene's appropriate play responses with the Simon game during the base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 8

1) Comparison of Irene's Simon M-1 (*B*) with Simon base-rate (*A*).

a) The mean of Simon base-rate (*A*) was 0 APR's.

b) The mean of the last four days of Simon M-1 (*B*) was .5 APR's.

c) The difference between *B* and *A* was .5 APR'S.

d) There is no significant difference between Simon M-1 (*B*) and Simon base-rate (*A*), therefore hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition *A*) is not supported.

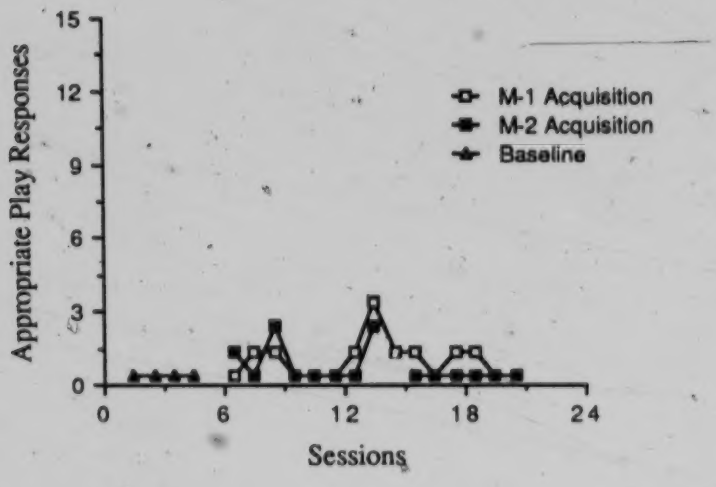


Figure 8. Irene's appropriate play responses with the Simon game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Irene responded to the natural discriminitive stimuli during the sequence of steps for the Simon game per session.

2) Comparison of Irene's Simon M-2 (*E*) with Simon base-rate (*A*).

a) The mean of Simon baseline (*A*) was 0 APR's.

b) The mean of the last four days of Simon M-2 (*E*) was 0 APR's.

c) The difference between *E* and *A* was 0 APR's.

d) There is no significant difference between Simon M-2 (E) and Simon baseline (*A*), therefore hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*) is not supported.

3) Trend analysis for Irene's Simon M-1 (*B*).

a) A general horizontal trend occurred throughout the 15 treatments (sessions 6 to 20); the range was from a low of 0 APR's to a high of 1 APR's.

b) Treatment eight (session 13) accelerated to a high of 3 APR's.

4) Trend analysis for Irene's Simon M-2 (*E*).

a) A horizontal trend occurred throughout the fourteen days of treatment (sessions 6 to 20); the range was from a low of 0 APR's to a high of 3 APR's

5) Comparison of Irene's Simon M-1 (*B*) and Simon M-2 (*E*).

a) M-1 and M-2 coincide at 6 points.

b) M-1 and M-2 cross-over at 2 points.

c) 7/14 M-1 data points are above M-2 data points.

d) 2/14 M-2 data points are above M-1 data points.

6) Conclusion for Irene's acquisition phases Simon M-1 (*B*) and Simon M-2 (*E*).

Although 7 of M-1 data points are above M-2, the magnitude of the difference between these data points is not significant. Therefore, there is no significant difference between the trend lines of Simon M-1 and Simon M-2. Hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 9 shows Irene's appropriate play responses with the View-Master game during the base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 9

1) Comparison of Irene's View-Master M-1 (*B*) with View-Master base-rate (*A*).

a) The mean of View-Master base-rate (*A*) was 2 APR's.

b) The mean of the last four days of View-Master M-1 (*B*) was 8 APR's.

c) The difference between *B* and *A* was 6 APR'S.

d) The difference of 6 APR's supports hypothesis 1 (condition B would have a greater number of appropriate play responses than condition A).

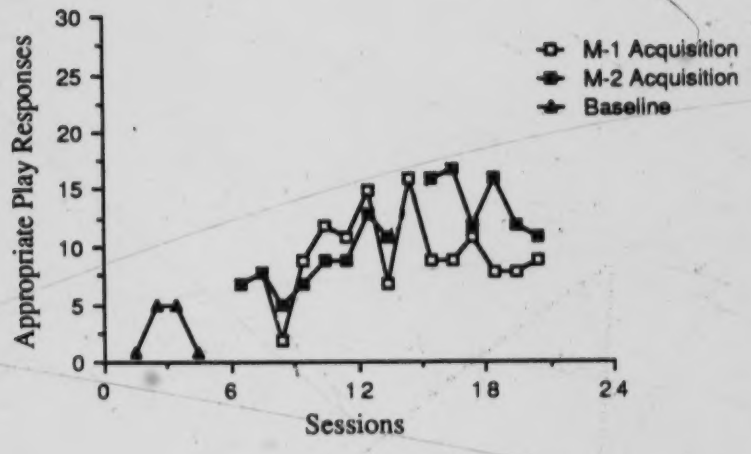


Figure 9. Irene's appropriate play responses with the View-Master game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Irene responded to the natural discriminitive stimuli during the sequence of steps for the View-Master game per session.

2) Comparison of Irene's View-Master M-2 (*E*) with View-Master base-rate (*A*).

a) The mean of View-Master baseline (*A*) was 2 APR's.

b) The mean of the last four days of View-Master M-2 (*E*) was 11.75 APR's.

c) The difference between *E* and *A* was 9.75 APR's.

d) The difference of 9.75 APR's supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*).

3) Trend analysis for Irene's View-Master M-1 (*B*).

a) A highly fluctuating accelerating trend was observed during the first nine treatments (sessions 6 to 14); the range was from a low of 1 APR to a high of 15 APR's.

b) During the last six treatments (sessions 15 to 20), a horizontal trend occurred; the range was from a low of 8 APR's to a high of 10 APR's.

4) Trend analysis for Irene's View-Master M-2 (*E*).

a) A fluctuating accelerating trend was observed during the first 10 treatments (sessions 6 to 15); the range was from low of 4 APR's to a high of 16 APR's.

b) A fluctuating decelerating trend occurred during the last four treatments (sessions 16 to 20); the range was from a high of 15 APR's to a low of 10 APR's.

5) Comparison of Irene's View-Master M-1 (*B*) and View-Master M-2 (*E*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 3 points.

c) 4/14 M-1 data points are above M-2 data points.

d) 8/14 M-2 data points are above M-1 data points.

6) Conclusion for Irene's acquisition phases View-Master M-1 (*B*) and View-Master M-2 and (*E*).

Although 8 out of 14 data points of M-2 are above M-1, the magnitude of the differences between these points is not significant. Therefore, there is no significant difference between the trend lines of View-Master M-1 and View-Master M-2. Hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 10 shows Nancy's appropriate play responses with the Perfection game during the base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 10

1) Comparison of Nancy's Perfection M-1 (*B*) with Perfection base-rate (*A*).

a) The mean of Perfection base-rate (*A*) was 5.25 APR's.

b) The mean of the last four days of Perfection M-1 (*B*) was 17.75 APR's.

c) The difference between *B* and *A* was 12.5 APR'S.

d) The difference between *B* and *A* of 12.5 APR's supports hypothesis 1

(condition B would have a greater number of appropriate play responses than condition A).

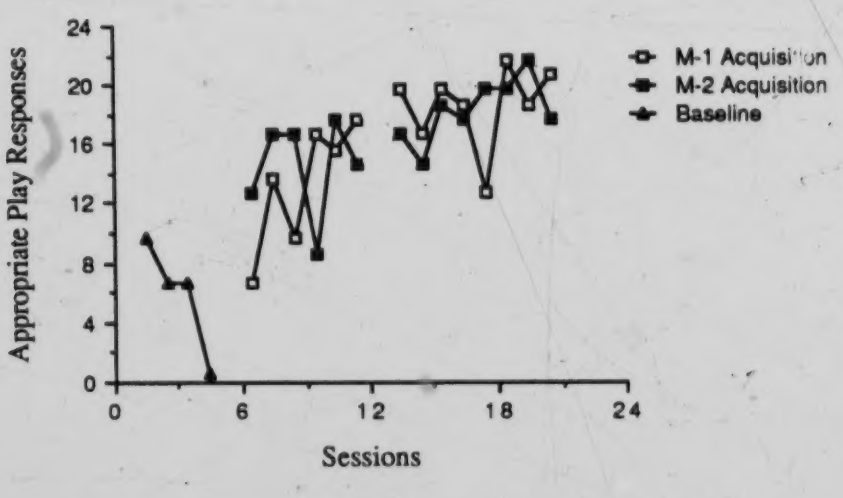


Figure 10. Nancy's appropriate play responses with the Perfection game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Nancy responded to the natural discriminitive stimuli during the sequence of steps for the Perfection game per session.

2) Comparison of Nancy's Perfection M-2 (*E*) with Perfection base-rate (*A*).

a) The mean of Perfection baseline (*A*) was 5.25 APR's.

b) The mean of the last four days of Perfection M-2 (*E*) was 19 APR's.

c) The difference between *E* and *A* was 13.75 APR's.

d) The difference of 13.75 APR's supports hypothesis 2 (condition E would have a greater number of appropriate play responses than condition A).

3) Trend analysis for Nancy's Perfection M-1 (*B*).

a) A fluctuating accelerating trend occurred throughout the 14 treatments (sessions 6 to 20); the range was from a low of 6 APR's to a high of 21 APR's.

4) Trend analysis for Nancy's Perfection M-2 (*E*).

a) A fluctuating accelerating trend occurred throughout the 14 treatments (sessions 6 to 20); the range was from a low of 8 APR's to a high of 21 APR's.

5) Comparison of Nancy's Perfection M-1 (*B*) and Perfection M-2 (*E*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 7 points.

c) 8/14 M-1 data points are above M-2 data points.

d) 6/14 M-2 data points are above M-1 data points.

6) Conclusion for Nancy's acquisition phases Perfection M-1 (*B*) and Perfection M-2 (*E*).

There is no significant difference between the trend lines of Perfection M-1 and Perfection M-2. Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 11 shows Nancy's appropriate play responses with the Simon game during the base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 11

1) Comparison of Nancy's Simon M-1 (*B*) with Simon base-rate (*A*).

a) The mean of Simon base-rate (*A*) was 1.25 APR's.

b) The mean of the last four days of Simon M-1 (*B*) was 3.5 APR's.

c) The difference between *B* and *A* was 2.25 APR'S.

d) The difference of 2.25 supports hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition *A*).

2) Comparison of Nancy's Simon M-2 (*E*) with Simon base-rate (*A*).

a) The mean of Simon base-rate (*A*) was 1.25 APR's.

b) The mean of the last four days of Simon M-2 (*E*) was 3.25 APR's.

c) The difference between *E* and *A* was 2 APR's.

d) The difference of 2 APR's supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*).

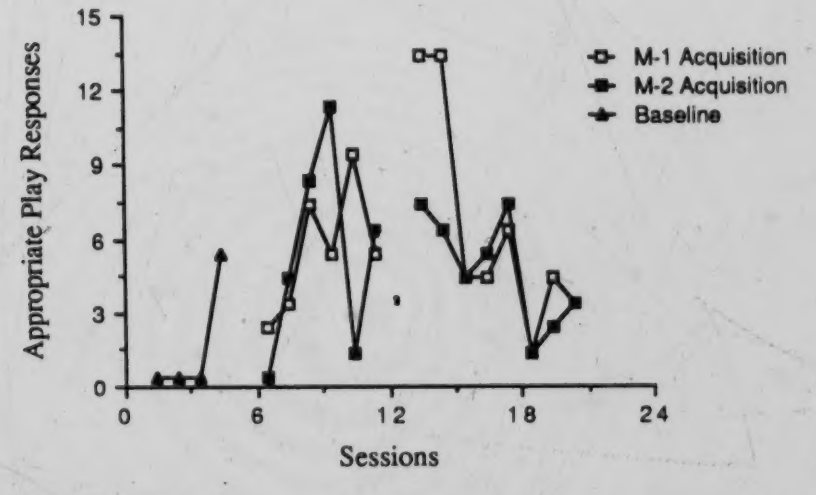


Figure 11. Nancy's appropriate play responses with the Simon game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Nancy responded to the natural discriminitive stimuli during the sequence of steps for the Simon game per session.

3) Trend analysis for Nancy's Simon M-1 (*B*).

a) The first eight treatments (sessions 6 to 13) resulted in a fluctuating accelerating trend; the range was from a low of 2 APR's to a high of 13 APR's.

b) The last six treatments (sessions 14 to 20) resulted in a fluctuating decelerating trend; the range was from a high of 6 APR's to a low of 1 APR.

4) Trend analysis for Nancy's Simon M-2 (*E*).

a) The first four treatments (sessions 6 to 9) resulted in a marked accelerating

trend; the range was from a low of 0 APR's to a high of 11 APR's.

b) From treatment four to treatment five (session 7 to session 8) a deceleration from 11 APR's to 1 APR was observed.

c) Treatments 6 to 14 (sessions 9 to 20) resulted in a fluctuating declerating trend; the range was from a high of 7 APR's to a low of 1 APR.

5) Comparison of Nancy's Simon M-1 (*B*) and Simon M-2 (*E*).

a) M-1 and M-2 coincide at 3 points.

b) M-1 and M-2 cross-over at 3 points.

c) 5/14 M-1 data points are above M-2 data points.

d) 6/14 M-2 data points are above M-1 data points.

6) Conclusion for Nancy's acquisition phases Simon M-1 (*B*) and Simon M-2 (*E*).

There is no significant difference between the trend lines of Simon M-1 and Simon M-2. Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 12 shows Nancy's appropriate play responses with the View-Master game during the base-rate (*A*) and acquisition phases of Method 1 (*B*) and Method 2 (*E*).

Analysis of Figure 12

1) Comparison of Nancy's View-Master M-1 (*B*) with View-Master base-rate (*A*).

a) The mean of View-Master base-rate (*A*) was 6.25 APR's.

b) The mean of the last four days of View-Master M-1 (*B*) was 19.5 APR's.

c) The difference between *B* and *A* was 13.25 APR'S.

d) The difference of 13.25 APR's supports hypothesis 1 (condition *B* would have a greater number of appropriate play responses than condition *A*).

2) Comparison of Nancy's View-Master M-2 (*E*) with View-Master base-rate (*A*).

a) The mean of View-Master base-rate (*A*) was 6.25 APR's.

b) The mean of the last four days of View-Master M-2 (*E*) was 20.75 APR's.

c) The difference between *E* and *A* was 14.5 APR's.

d) The difference of 14.5 APR's supports hypothesis 2 (condition *E* would have a greater number of appropriate play responses than condition *A*).

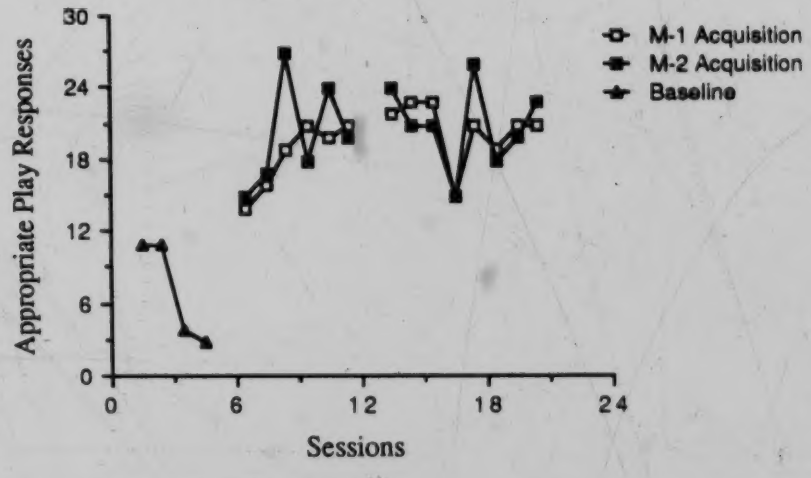


Figure 12. Nancy's appropriate play responses with the View-Master game during baseline (*A*) and the acquisition phases of Method 1 (*B*) and Method 2 (*E*). Appropriate play responses equal the number of times Nancy responded to the natural discriminitive stimuli during the sequence of steps for the View-Master game per session.

3) Trend analysis for Nancy's View-Master M-1 (*B*).

a) During the first 9 treatments (sessions 6 to 15) a general accelerating trend was observed; the range was from a low of 13 APR's to a high of 22 APR's.

b) A deceleration from 22 APR's to 14 APR's occurred from treatment 9 to 10 (session 15 to 16) and an acceleration from 14 APR's to 20 APR's occurred from treatment 10 to 11 (session 16 to 17).

c) The last four treatments (sessions17 to 20) resulted in a horizontal trend; the range was from a low of 18 APR's to a high of 20 APR's.

4) Trend analysis for Nancy's View-Master M-2 (*E*).

a) During the first 7 treatments (sessions 6 to 13) a fluctuating accelerating trend is observed; the range was from a low of 14 APR's to a high of 23 APR's.

b) A general deceleration occurred during treatments 7 to 10 (sessions 13 to 16); the range was from a high of 23 APR's to a low of 14 APR's.

c) An acceleration from 14 APR's to 25 APR's was noted during treatment 10 and 11 (sessions 16 and 17). This was followed by a deceleration from 25 APR's to 17 APR's during treatments 11 and 12 (sessions 16 and17).

d) During the last three treatments (sessions 18 to 20) an acclerating trend was observed; the range was from a low of 17 APR's to a high of 22 APR's.

5) Comparison of Nancy's View-Master M-1 (*B*) and View-Master M-2 (*E*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 6 points.

c) 6/14 M-1 data points are above M-2 data points.

d) 7/14 M-2 data points are above M-1 data points.

6) Conclusion for Nancy's acquisition phases View-Master M-1 (*B*) and View-Master M-2 and (*E*).

There is no significant difference between the trend lines of View-Master M-1 and View-Master M-2. Therefore hypotheses 3, there will be no significant difference between conditions *B* and *E* with respect to the number of appropriate toy play responses, is supported.

Figure 13 compares Andrew's duration of appropriate toy play responses during generalization phases *C* (Method 1) and *F* (method 2).

Analysis of Figure 13

1) Trend analysis for Andrew's duration of appropriate toy play responses M-1 (*C*).

a) There was generally a horizontal trend over 8 of the 10 treatments; the range was from a low of 0 minutes to a high of 3.38 minutes.

b) Accelerating fluctuations occurred during session 7 to 2.72 minutes and session 10 to 3.38 minutes.

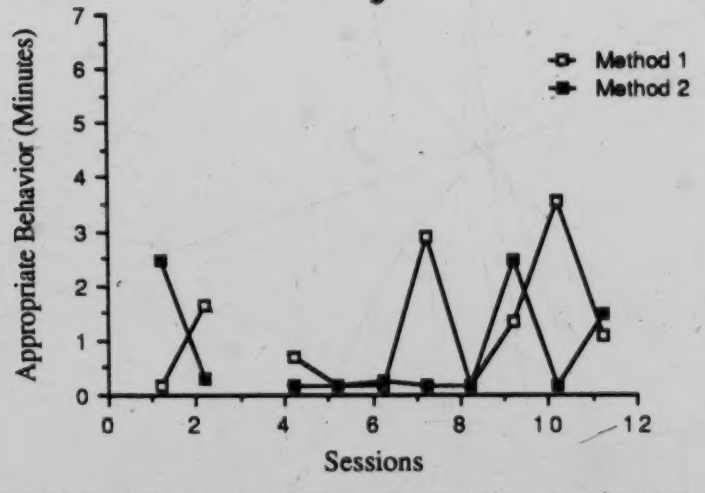


Figure 13. Comparison of Andrew's duration of appropriate toy play responses in minutes during generalization phases *C* (Method 1) and *F* (Method 2). The generalization phase was carried out for seven minutes, therefore maximum attainable duration of appropriate toy play responses equals seven minutes.

2) Trend analysis for Andrew's duration of appropriate toy play responses M-2 (*F*).

a) There was a generally horizontal trend throughout 7 of the 10 treatments; the range was from a low of 0 minutes to a high of .15 minutes.

b) Accelerating fluctuations occurred during sessions 1 and 9 to 2.3 minutes and during session 11 to 1.28 minutes.

3) Comparison of Andrew's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 4 points.

c) 4/10 M-1 data points are above M-2 data points.

d) 4/10 M-2 data points are above M-1 data points.

4) Conclusion for Andrew's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

There is no significant difference between M-1 and M-2 with respect to Andrew's duration of appropriate toy play responses during generalization phases *C* and *F*. Therefore hypothesis 4, condition *F* will have a longer duration of appropriate toy play responses than condition *C*, is not supported.

Figure 14 compares Andrew's number of inappropriate behaviors during generalization phases *C* (M-1) and *F* (M-2).

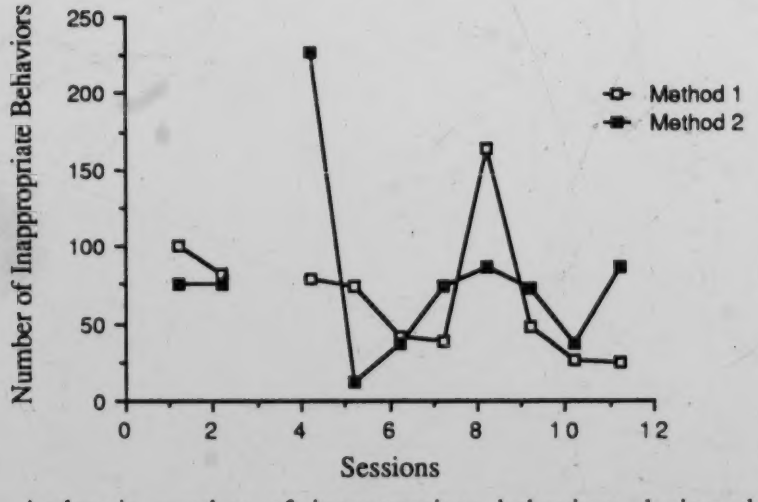


Figure 14. Andrew's number of inappropriate behaviors during the generalization phases *C* (Method 1) and *F* (Method 2). Number of inappropriate behaviors equals total number per seven minute sessions.

Analysis of Figure 14

1) Trend analysis for Andrew's number of inappropriate behaviors M-1 (*C*).

a) A decelerating trend was observed during sessions 1 to 7; the range was from a high of 94 inappropriate behaviors to a low of 32 inappropriate behaviors.

b) An acceleration occurred during session 8 from 32 to 157 inappropriate behaviors.

c) A decelerating trend occurred from sessions 8 to 11; the range was from a high of 157 inappropriate behaviors to a low of 19 inappropriate behaviors.

2) Trend analysis for Andrew's number of inappropriate behaviors M-2 (*F*).

a) A general horizontal trend occurred during 8 of the 10 treatments; the range was from a low of 31 inappropriate behaviors to a high of 81 inappropriate behaviors. The mean was 62.13 inappropriate behaviors.

b) An acceleration occurred during session 4 to 221 inappropriate behaviors and a deceleration occurred during session 5 to 6 inappropriate behaviors.

3) Comparison of Andrew's number of inappropriate behaviors during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 4 points.

c) 5/10 M-1 data points are less than M-2 data points.

d) 5/10 M-2 data points are less than M-1 data points.

4) Conclusion for Andrew's number of inappropriate behaviors during phases M-1 (*C*) and M-2 (*F*).

There is no significant difference between M-1 and M-2 with respect to Andrew's number of inappropriate behaviors during generalization phases *C* and *F*. Therefore hypothesis 5, condition *F* will have fewer inappropriate behaviors than in condition *C*, is not supported.

Figure 15 shows Andrew's number of appropriate play responses (level one) during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 15

1) Trend analysis for Andrew's level one appropriate play responses during M-1 (*C*).

a) A widely fluctuating horizontal trend resulted in the 10 treatments of M-1; the

range was from a low of 0 APR's to a high of 20 APR's. The mean was 6.8 APR's.

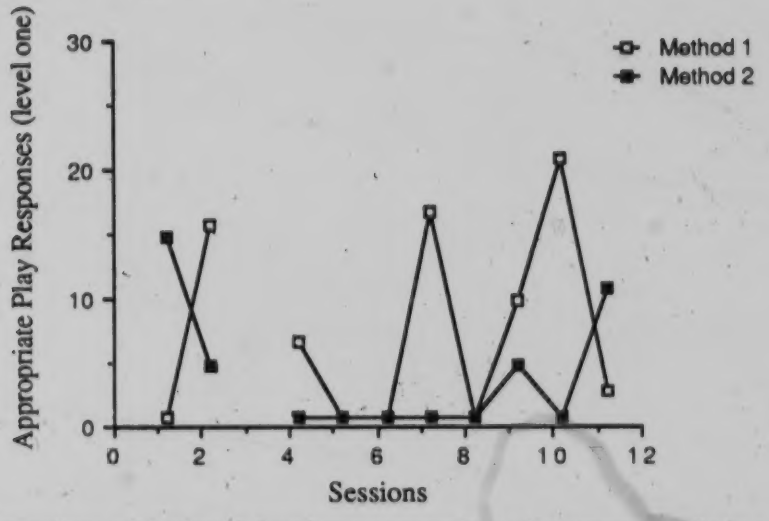


Figure 15. Comparison of Andrew's level one appropriate play responses during generalization phases C (M-1) and F (M-2). Level one appropriate play responses was defined as randomly performing a variety of steps in the sequence of steps for each game in an illogical order. A step was also classified as level one if it was performed incorrectly.

2) Trend analysis for Andrew's level one appropriate play responses during M-2 (*F*).

a) A decelerating trend was observed during sessions 1 to 4; the range was from a high of 14 APR's to a low of 0 APR's.

b) A horizontal trend occurred during sessions 4 to 11. All sessions were at 0 APR's with the exception of sessions 9 and 11 which accelerated to 4 APR's and 10 APR's respectively.

3) Comparison of Andrew's level one appropriate play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 3 points.

b) M-1 and M-2 cross-over at 2 points.

c) 5/10 M-1 data points are above M-2 data points.

d) 2/10 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Andrew's level one appropriate play responses during M-1 (*C*) and M-2 (*F*).

Where M-1 was over M-2, the average magnitude of the difference was 11.6 APR's. It appears then that M-1 resulted in more level one APR's than did M-2. Therefore hypothesis 6, condition *F* will have more level one appropriate play responses than condition *C*, is not supported.

Figure 16 shows Andrew's number of appropriate play responses (level two) during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 16

1) Trend analysis for Andrew's level two appropriate play responses during M-1 (*C*).

a) A horizontal trend occurred during sessions 1 to 9; the range was from a low of 0 APR's to a high of 3 APR's.

b) An accelerating trend was observed during sessions 9 to 11; the range was from a low of 0 APR's to a high of 10 APR's.

2) Trend analysis for Andrew's level two appropriate play responses during M-2 (*F*).

a) A deceleration occurred during sessions 1 and 2, from a high of 10 APR's to a low of 0 APR's.

b) A horizontal trend resulted during 7 out of the 8 remaining sessions; the range was from a high of 1 APR to a low of 0 APR's

c) Session 9 resulted in an acceleration from 0 APR's to 9 APR's.

3) Comparison of Andrew's level two APR's during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 4 points.

b) M-1 and M-2 cross-over at 2 points.

c) 3/10 M-1 data points are above M-2 data points.

d) 3/10 M-2 data points are above M-1 data points.

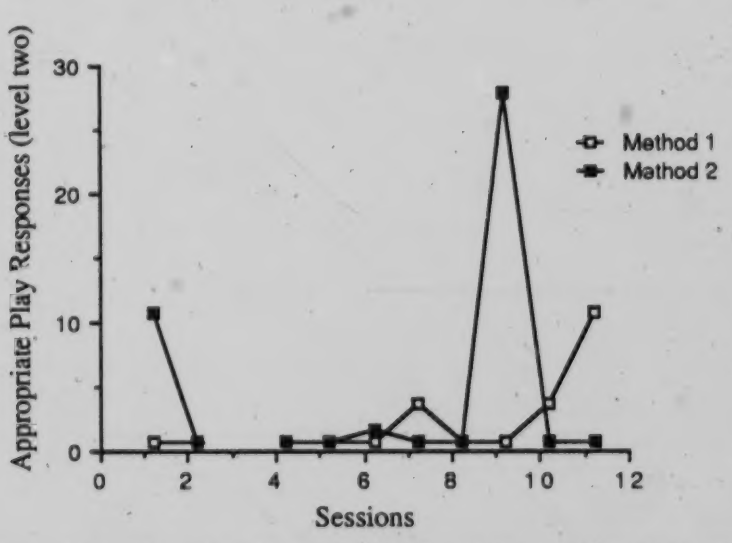


Figure 16. Comparison of Andrew's number of level two appropriate play responses during generalization phases *C* (M-1) and *F* (M-2). Level two appropriate play responses were defined as the linking together of two or more steps in the sequence of steps for each game. That is, the student had to carry out at least two steps in the proper sequence for each game before these steps would be classified as level two.

4) Conclusion for the comparison of Andrew's level two appropriate play responses during M-1 (*C*) and M-2 (*F*).

During two sessions, M-1 was over M-2 with a magnitude of difference of 10 APR's and 27 APR's (mean magnitude of the difference equals 18.50 APR's). Alternatively, one session of M-1 was over M-2 by a magnitude of 10 APR's. Therefore, there is no significant difference between M-1 and M-2 with respect to Andrew's number of level two appropriate play responses during the generalization phases *C* and *F*. Hypothesis 7, condition *F* will have more level two appropriate play responses than condition *C*, is not supported.

Figure 17 compares Anne's duration of appropriate toy play responses during generalization phases *C* (Method 1) and *F* (method 2).

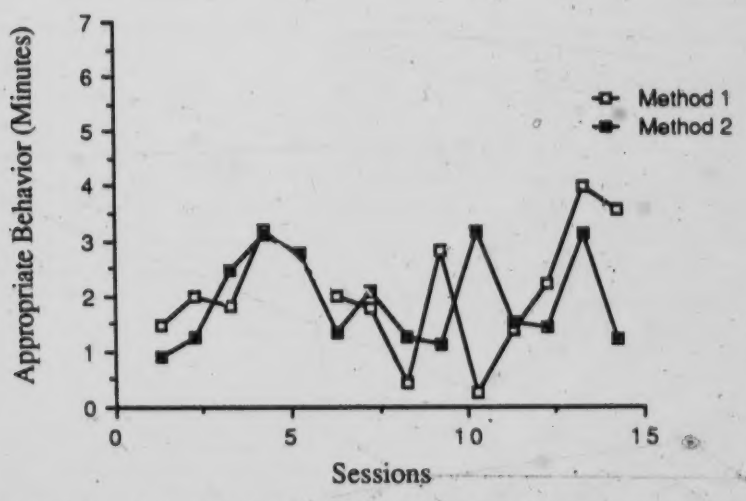


Figure 17. Comparison of Anne's duration of appropriate toy play responses in minutes during generalization phases *C* (Method 1) and *F* (Method 2). The generalization phase was carried out for seven minutes, therefore the maximum attainable duration of appropriate toy play responses equals seven minutes.

Analysis of Figure 17

1) Trend analysis for Anne's duration of appropriate toy play responses M-1 (*C*).

a) A widely fluctuating horizontal trend occurred during sessions 1 to 12; the range was from a low of 0.07 minutes to a high of 3.03 minutes. The mean is 1.58 minutes.

b) An accelerating trend occurred during sessions 12 to 14; the range was from a low of 2.02 minutes to a high of 3.80 minutes.

2) Trend analysis for Anne's duration of appropriate toy play responses M-2 (*F*).

a) M-2 had generally similar trends to M-1, however there was an accelerating trend during sessions 1 to 4 (range was from a low of .73 minutes to a high of

2.93 minutes), with a decelerating trend during sessions 5 to 7 (the range was from a high of 2.58 minutes to a low of 1.17 minutes).

b) The remainder of the sessions from 8 to 14 resulted in a horizontal trend; the range was from a low of .97 minutes to a high of 2.97 minutes.

3) Comparison of Anne's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 6 points.

c) 8/13 M-1 data points are above M-2 data points.

d) 6/13 M-2 data points are above M-1 data points.

4) Conclusion for Anne's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

There is no significant difference between M-1 and M-2 with respect to Anne's duration of appropriate play responses during generalization phases *C* and *F*. Therefore hypothesis 4, condition *F* will have a longer duration of appropriate toy play responses than condition *C*, is not supported.

Figure 18 compares Anne's number of inappropriate behaviors during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 18

1) Trend analysis for Anne's number of inappropriate behaviors M-1 (*C*).

a) A widely fluctuating horizontal trend was observed during sessions 1 to 4; the range was from a low of 10 inappropriate behaviors to a high of 24 inappropriate behaviors. The mean was 18.25 inappropriate behaviors.

b) An acceleratiing trend occurred during sessions 4 to 6; the range was from a low of 24 inappropriate behaviors to a high of 55 inappropriate behaviors.

c) A decelerating trend resulted from sessions 6 to 10; the range was from a high of 55 inappropriate behaviors to a low of 3 inappropriate behaviors.

d) A widely fluctuating decelerating trend also occurred from sessions 10 to 14; the range was from a high of 16 inappropriate behaviors to a low of 1 inappropriate behaviors. The mean was 16.2 inappropriate behaviors.

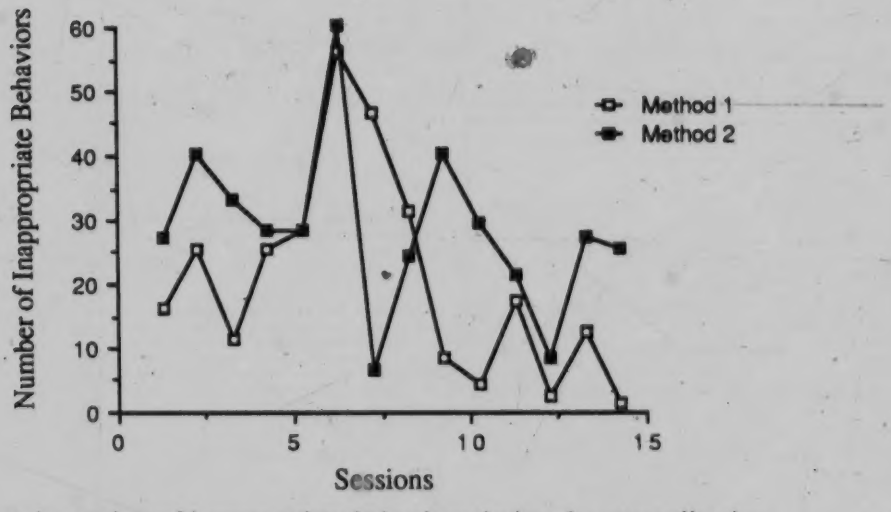


Figure 18. Anne's number of inappropriate behaviors during the generalization phases *C* (Method 1) and *F* (Method 2). Number of inappropriate behaviors equals total number per seven minute session.

2) Trend analysis for Anne's number of inappropriate behaviors M-2 (*F*).

a) A fluctuating horizontal trend occurred during sessions 1 to 5; the range was from a low of 26 inappropriate behaviors to a high of 39 inappropriate behaviors.

b) Following session 5, an acceleration occurred from 27 to 59 inappropriate behaviors and a deceleration from 59 to 5 inappropriate behaviors.

c) The remaining 7 sessions resulted in wide fluctuations; the range was from a low of 7 inappropriate behaviors to a high of 39 inappropriate behaviors.

3) Comparison of Anne's number of inappropriate behaviors during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at one point.

b) M-1 and M-2 cross-over at 2 points.

c) 11/13 M-1 data points are less than M-2 data points.

d) 2/13 M-2 data points are less than M-1 data points.

4) Conclusion for Anne's number of inappropriate behaviors during phases M-1 (*C*) and M-2 (*F*).

The mean magnitude of the difference between M-1 and M-2 where M-1 is less than M-2 is 14.7 inappropriate behaviors. Therefore, it appears that in general M-1 resulted in a lower number of inappropriate behaviors with respect to Anne during the generalization phases. Hypothesis 5, condition *F* will have fewer inappropriate behaviors than condition *C*, is not supported.

Figure 19 shows Anne's number of appropriate play responses (level one) during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 19

1) Trend analysis for Anne's level one appropriate play responses during M-1 (*C*).

a) Wide fluctuations occurred between sessions 1 to 4; the range was from a low of 2 APR's to a high of 19 APR's.

b) A horizontal trend was observed during sessions 6 to 13; the range was from a low of 2 APR's to a high of 7 APR's.

c) Sessions 14 resulted in an acceleration from 2 APR's to 18 APR's.

2) Trend analysis for Anne's level one appropriate play responses during M-2 (*F*).

a) A variable horizontal trend occurred during 11 of the 14 sessions; the range was from a low of 2 APR's to a high of 8 APR's. The mean was 5.45 APR's.

b) Sessions 2 and 9 resulted in decelerations to 1 APR and 0 APR's respectively and session 10 resulted in an acceleration to 11 APR's.

3) Comparison of Anne's level one APR's during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 8 points.

c) 8/13 M-1 data points are above M-2 data points.

d) 5/14 M-2 data points are above M-1 data points.

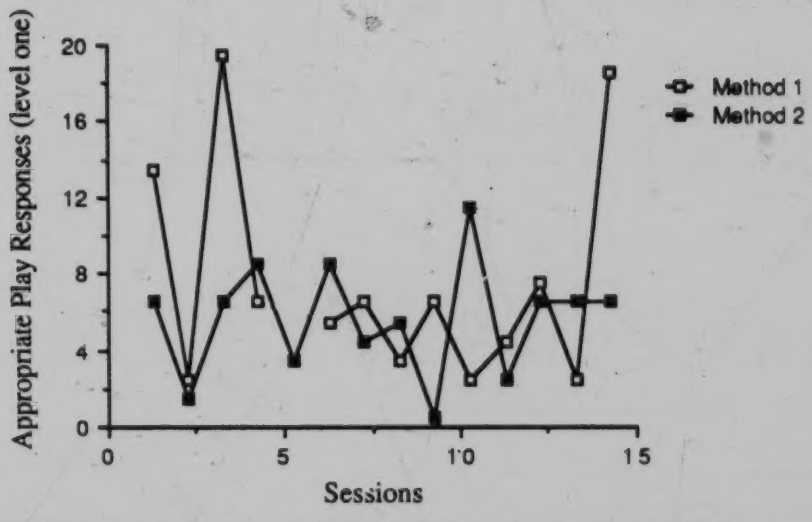


Figure 19. Comparison of Anne's level one appropriate play responses during generalization phases C (M-1) and F (M-2). Level one appropriate play responses were defined as randomly performing a variety of steps in the sequence of steps for each game in an illogical order. A step was also classified as level one if it was performed incorrectly.

4) Conclusion for the comparison of Anne's level one appropriate play responses during M-1 (*C*) and M-2 (*F*).

From trials 4 to 13, there is no significant difference between M-1 and M-2. However, during sessions 1, 3 and 14, M-1 had a much higher number of APR's where the mean difference was 10.6 APR's. Hypothesis 6, condition *F* will have more level one appropriate play responses than condition *C*, is not supported. However, is does appear that on occasion M-1 produced more APR's than M-2.

Figure 20 shows Anne's number of appropriate play responses (level two) during

generalization phases *C* (M-1) and *F* (M-2).

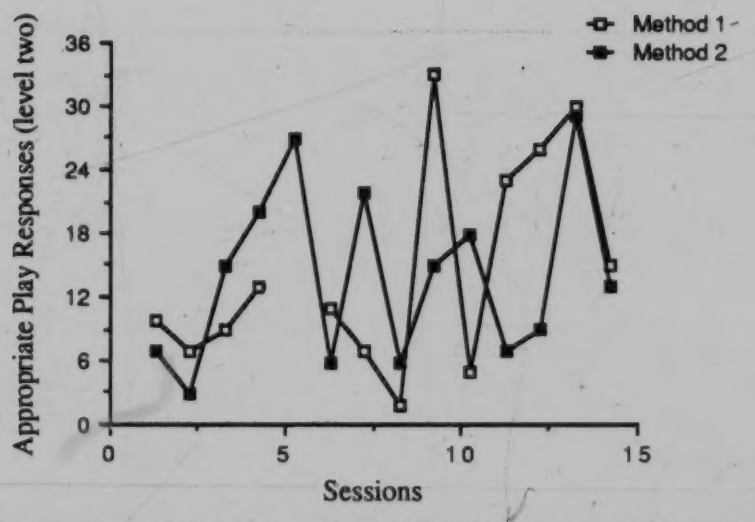


Figure 20. Comparison of Anne's number of level two appropriate play responses during generalization phase C (M-1) and F (M-2). Level two appropriate play responses were defined as the linking together of two or more steps in the sequence of steps for each game. That is, the student had to carry out at least two steps in the proper sequence for each game before these steps would be classified as level two.

Analysis of Figure 20

1) Trend analysis for Anne's level two appropriate play responses during M-1 (*C*).

a) A general horizontal trend occurred during sessions 1 to 6; the range was from a low of 6 APR's to a high of 12 APR's. The remaining sessions resulted in wide fluctuations.

b) A decelerating trend was observed during sessions 6 to 8; the range was from a high of 10 APR's to a low of 1 APR's.

c) An acceleration resulted during sessions 8 to 9; the range was from a low of 1 APR's to a high of 32 APR's.

d) A deceleration occurred during sessions 9 to 10 from a high of 32 APR's to a

low of 4 APR's.

e) An accelerating trend was observed during sessions 10 to 13; the range was from a low of 4 APR's to a high of 29 APR's.

f) Sessions 13 to 14 resulted in a deceleration from 29 APR's to 14 APR's.

2) Trend analysis for Anne's level two appropriate play responses during M-2 (*F*).

a) An accelerating trend occurred during sessions 1to 5; the range was from a low of 2 APR's to a high of 26 APR's.

b) A wide fluctuating horizontal trend resulted from sessions 6 to 14; the range was from a high of 28 APR to a low of 5 APR's.

3) Comparison of Anne's level two appropriate play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 5 points.

c) 8/13 M-1 data points are above M-2 data points.

d) 5/14 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Anne's level two appropriate play responses during M-1 (*C*) and M-2 (*F*).

It appears that during the first half of the condition, M-2 had more appropriate play responses than M-1. However, during the second half of the condition, M-1 had more appropriate play responses than M-2. Overall, no method produced more appropriate play responses than the other. Therefore hypothesis 7, condition *F* will have more level two appropriate play responses than condition *C*, is not supported.

Figure 21 compares Irene's duration of appropriate toy play responses during generalization phases *C* (Method 1) and *F* (Method 2).

Analysis of Figure 21

1) Trend analysis for Irene's duration of appropriate toy play responses M-1 (*C*).

a) A horizontal trend occurred during 12 of the 15 sessions with all levels staying

at 0.0 minutes.

b) Accelerating fluctuations occurred during sessions 5, 8, and 10 to 0.42, 1.25, and 1.28 minutes respectively.

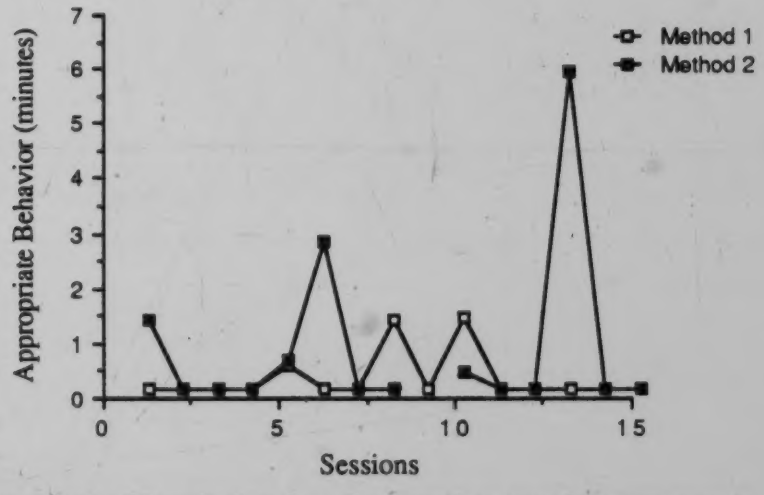


Figure 21. Comparison of Irene's duration of appropriate toy play responses in minutes during generalization phases *C* (Method 1) and *F* (Method 2). The generalization phase was carried out for seven minutes, therefore the maximum attainable duration of appropriate toy play responses equals seven minutes.

2) Trend analysis for Irene's duration of appropriate toy play responses M-2 (*F*).

a) A horizontal trend occurred during 11 of the 14 sessions; the range was from a low of 0.0 minutes to a high of 0.53 minutes.

b) Accelerating fluctuations occurred during sessions 1, 6, and 13 to 1.27, 2.7, and 5.75 minutes respectively.

3) Comparison of Irene's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 8 points.

b) M-1 and M-2 do not cross-over.

c) 2/14 M-1 data points are above M-2 data points.

d) 4/14 M-2 data points are above M-1 data points.

4) Conclusion for Irene's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

The mean magnitude of the difference where M-2 was greater than M-1 is 2.45 minutes. The mean magnitude of the difference where M-1 was greater than M-2 is 1.10 minutes. Therefore, M-2 on occasion produces longer durations of appropriate toy play responses than M-1. However, M-1 and M-2 also coincide at 8 points. Therefore, hypothesis 4, condition *F* will have a longer duration of appropriate toy play responses than condition *C*, is not supported.

Figure 22 compares Irene's number of inappropriate behaviors during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 22

1) Trend analysis for Irene's number of inappropriate behaviors M-1 (*C*).

a) A deceleration was observed from session 1 to 2, from 111 inappropriate behaviors to 6 inappropriate behaviors.

b) A fluctuating accelerating trend occurred during sessions 2 to 6; the range was from a low of 30 inappropriate behaviors to a high of 357 inappropriate behaviors.

c) A decelerating trend resulted from sessions 6 to 11; the range was from a high of 357 inappropriate behaviors to a low of 0 inappropriate behaviors.

d) Sessions 11 to 15 resulted in wide fluctuations; the range was from a low of 0 inappropriate behaviors to a high of 111 inappropriate behaviors. The mean was 46.6 inappropriate behaviors.

2) Trend analysis for Irene's number of inappropriate behaviors M-2 (*F*).

a) A decelerating trend occurred throughout the 14 treatments (15 sessions); the range was from a high of 202 to a low of 25 inappropriate behaviors.

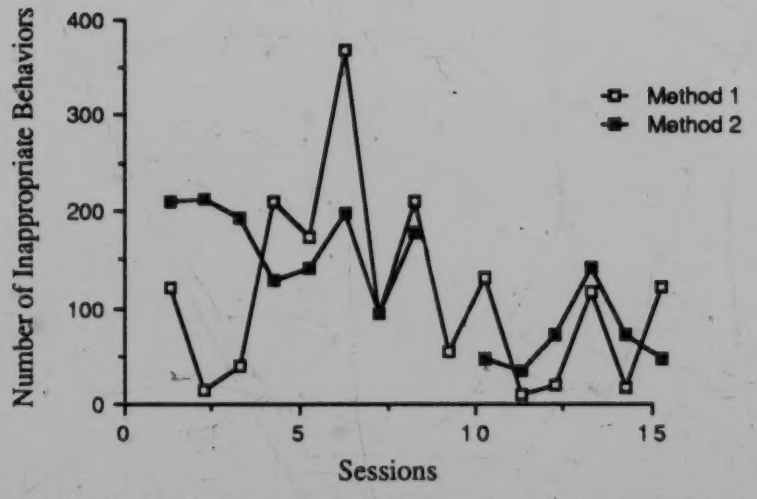


Figure 22. Irene's number of inappropriate behaviors during the generalization phases *C* (Method 1) and *F* (Method 2). Number of inappropriate behaviors equals total number per seven minute session.

3) Comparison of Irene's number of inappropriate behaviors during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 3 points.

c) 8/14 M-1 data points are less than M-2 data points.

d) 6/14 M-2 data points are less than M-1 data points.

4) Conclusion for Irene's number of inappropriate behaviors during phases M-1 (*C*) and M-2 (*F*).

There is no significant difference between M-1 and M-2 with respect to Irene's number of inappropriate behaviors during generalization phases *C* and *F*. Therefore hypothesis 5, condition *F* will have fewer inappropriate behaviors than in condition *C*, is not supported.

Figure 23 shows Irene's number of appropriate play responses (level one) during generalization phases *C* (M-1) and *F* (M-2).

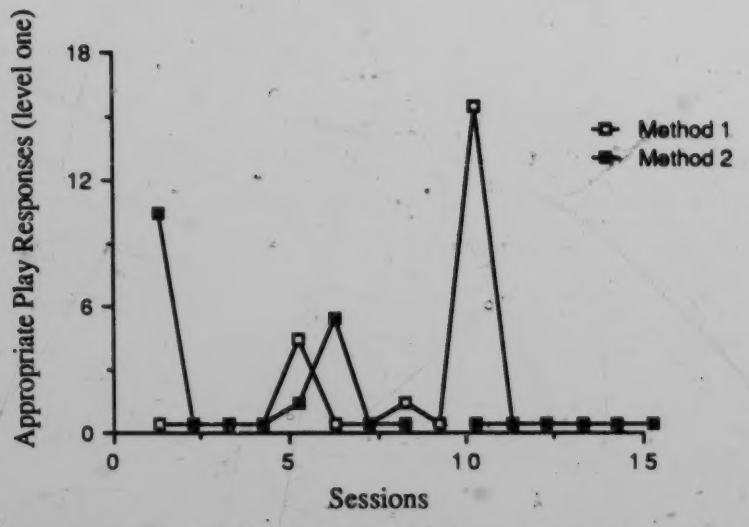


Figure 23. Comparison of Irene's level one appropriate play responses during generalization phases C (M-1) and F (M-2). Level one appropriate play responses were defined as randomly performing a variety of steps in the sequence of steps for each game in an illogical order. A step was also classified as level one if it was performed incorrectly.

Analysis of Figure 23

1) Trend analysis for Irene's level one appropriate play responses during M-1 (*C*).

a) A general horizontal trend resulted in 13 of the 15 sessions; the range was from a low of 0 APR's to a high of 1 APR.

b) Sessions 5 and 10 accelerated to 4 and 15 APR's respectively.

2) Trend analysis for Irene's level one appropriate play responses during M-2 (*F*).

a) A general horizontal trend resulted in 12 of the 14 treatments (12 of the 15 sessions); the range was from a low of 0 APR's to a high of 1 APR.

b) Sessions 1 and 6 accelerated to 10 and 5 APR's respectively.

3) Comparison of Irene's level one appropriate play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 10 points.

b) M-1 and M-2 cross-over at 1 points.

c) 1/14 M-1 data points are above M-2 data points.

d) 3/14 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Irene's level one appropriate play responses during M-1 (*C*) and M-2 (*F*).

There was no significant difference between M-1 and M-2 with respect to Irene's number of level one appropriate play responses during the generalization phases. Therefore hypothesis 6, condition *F* will have more level one appropriate play responses than condition *C*, is not supported.

Figure 24 shows Irene's number of appropriate play responses (level two) during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 24

1) Trend analysis for Irene's level two appropriate play responses during M-1 (*C*).

a) A horizontal trend was observed in 14 of the 15 sessions with a range of 0 APR's.

b) Session 8 resulted in an acceleration to 6 APR's.

2) Trend analysis for Irene's level two appropriate play responses during M-2 (*F*).

a) A horizontal trend was observed during sessions 1 to 4 with a range of 0 APR's.

b) An acceleration occurred during sessions 4 to 6; the range was from a low of 0 APR's to a high of 9 APR's.

c) Sessions 6 to 8 resulted in a deceleration; the range was from a high of 9 APR's to a low of 0 APR's.

d) Sessions 8 to 10 resulted in an acceleration, from a low of 0 APR's to a high of 7 APR's.

e) With the exception of session 13 which accelerated to 2 APR's, a general horizontal trend was observed during sessions 11 to 15 with a range of 0 APR's.

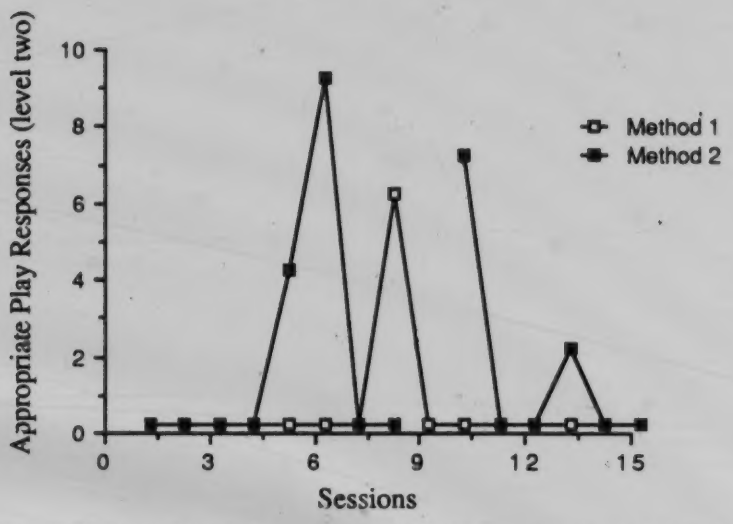


Figure 24. Comparison of Irene's number of level two appropriate play responses during generalization phases *C* (M-1) and *F* (M-2). Level two appropriate play responses were defined as the linking together of two or more steps in the sequence of steps for each game. That is, the student had to carry out at least two steps in the proper sequence for each game before these steps would be classified as level two.

3) Comparison of Irene's level two appropriate play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 9 points.

b) M-1 and M-2 do not cross-over.

c) 1/14 M-1 data points are above M-2 data points.

d) 4/15 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Irene's level two appropriate play responses during M-1 (*C*) and M-2 (*F*).

M-2 occasionally (sessions 5, 6, 10 and 13) results in more APR's than does M-1. The average magnitude of the difference between M-2 and M-1, where M-2 is greater than M-1, is 4 APR's. However, it is also apparent that during 9 of the 14 sessions, M-1 and M-2 produced the same number of APR's. Therefore, although M-2 appears to be slightly more effective than M-1, hypothesis 7 (condition *F* will have more level

two appropriate play responses than condition *C*) is not supported.

Figure 25 compares Nancy's duration of appropriate toy play responses during generalization phases *C* (Method 1) and *F* (method 2).

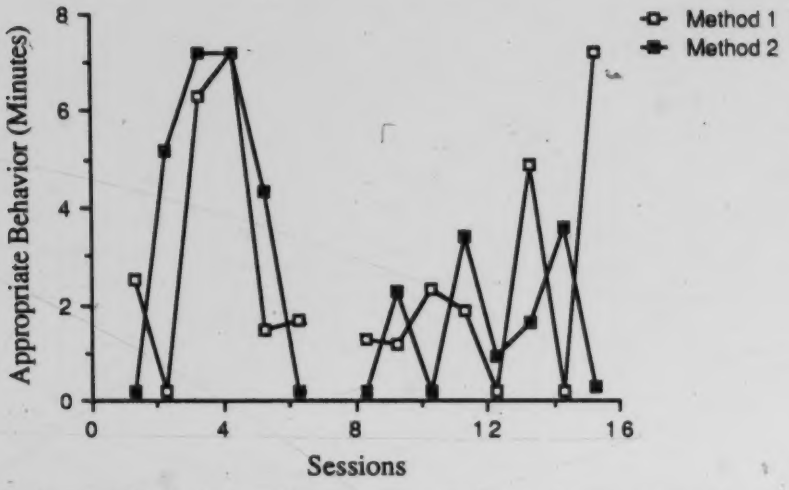


Figure 25. Comparison of Nancy's duration of appropriate toy play responses in minutes during generalization phases C (Method 1) and F (Method 2). The generalization phase was carried out for seven minutes, therefore the maximum attainable duration of appropriate toy play responses equals seven minutes.

Analysis of Figure 25

1) Trend analysis for Nancy's duration of appropriate toy play responses M-1 (*C*).

a) Wide fluctuations occurred during sessions 1 to 5; the range was from a low of 0 minutes to a high of 7 minutes. The mean was 4.18 minutes.

b) A horizontal trend was observed during sessions 5 to 11; the range was from a low of 1.0 minute to a high of 2.1 minutes.

c) Sessions 11 to 14 resulted in wide fluctuations; the range was from a low of 0.0 minutes to a high of 7.0 minutes. The mean was 2.92 minutes.

2) Trend analysis for Nancy's duration of appropriate toy play responses M-2 (*F*).

a) Wide fluctuations occurred throughout sessions 1 to 6; the range was from a

low of 0.0 minutes to a high of 7.0 minutes. The mean was 3.86 minutes.

b) Wide fluctuations also occurred throughout sessions 8 to 15; the range was from a low of 0.0 minutes to a high of 3.4 minutes. The mean was 1.37 minutes.

3) Comparison of Nancy's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 7 points.

c) 6/14 M-1 data points are above M-2 data points.

d) 7/14 M-2 data points are above M-1 data points.

4) Conclusion for Nancy's duration of appropriate toy play responses during M-1 (*C*) and M-2 (*F*).

There was no significant difference between M-1 and M-2 with respect to Nancy's duration of appropriate play responses during generalization phases *C* and *F*. Therefore hypothesis 4, condition *F* will have a longer duration of appropriate toy play responses than condition *C*, was not supported.

Figure 26 compares Nancy's number of inappropriate behaviors during generalization phases *C* (M-1) and *F* (M-2

Analysis of Figure 26

1) Trend analysis for Nancy's number of inappropriate behaviors M-1 (*C*).

a) Wide fluctuations occurred during sessions 1 to 5; the range was from a low of 0 inappropriate behaviors to a high of 33 inappropriate behaviors. The mean was 17.8 inappropriate behaviors.

b) A deceleration was observed during sessions 6 to 10; the range was from a high of 33 inappropriate behaviors to a low of 2 inappropriate behaviors.

c) Session 11 resulted in an acceleration from 2 inappropriate behaviors to 8 inappropriate behaviors, followed by a deceleration to 0 inappropriate behaviors

during session 12.

d) A horizontal trend resulted during the last 4 sessions with a range of 0 inappropriate behaviors.

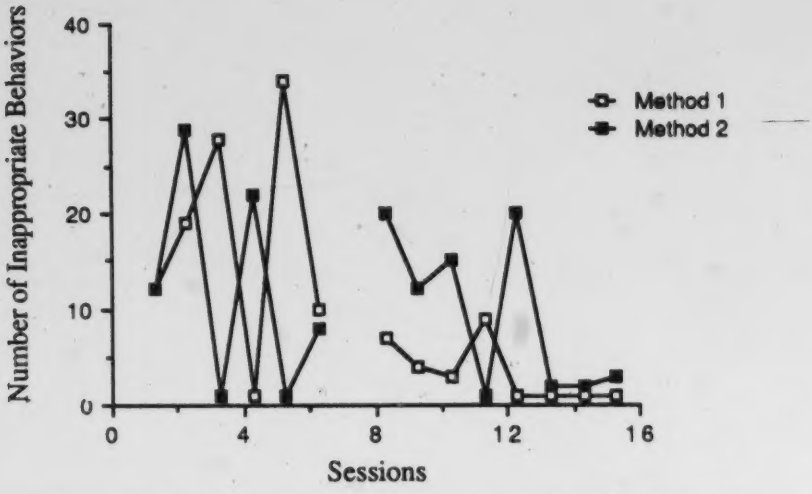


Figure 26. Comparison of Nancy's number of inappropriate behaviors during the generalization phases *C* (Method 1) and *F* (Method 2). Number of inappropriate behaviors equals total number per seven minute sessions.

2) Trend analysis for Nancy's number of inappropriate behaviors M-2 (*F*).

a) Wide fluctuations occurred during sessions 1 to 6; the range was from a low of 0 inappropriate behaviors to a high of 28 inappropriate behaviors. The mean was 11.17 inappropriate behaviors.

b) A deccelerating trend was observed during sessions 8 to 11; the range was from a high of 19 inappropriate behaviors to a low of 0 inappropriate behaviors.

c) Session 12 resulted in an acceleration from 0 inappropriate behaviors to 19 inappropriate behaviors, followed by a deceleration to 1 inappropriate behavior during session 13.

d) A horizontal trend resulted during the last 3 sessions; the range was from a

low of 1 inappropriate behavior to a high of 2 inappropriate behaviors. The mean was 1.3 inappropriate behaviors.

3) Comparison of Nancy's number of inappropriate behaviors during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 5 points.

c) 9/14 M-1 data points are less than M-2 data points.

d) 4/14 M-2 data points are less than M-1 data points.

4) Conclusion for Nancy's number of inappropriate behaviors during phases M-1 (*C*) and M-2 (*F*).

It appears that in general M-1 resulted in fewer inappropriate behaviors than M-2 with an average magnitude of difference being 9.7 inappropriate behaviors. Therefore, hypothesis 5, condition *F* will have fewer inappropriate behaviors than condition *C*, is not supported.

Figure 27 shows Nancy's number of appropriate play responses (level one) during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 27

1) Trend analysis for Nancy's level one appropriate play responses during M-1 (*C*).

a) An accelerating trend was observed during 6 of the sessions from 1 to 8; the range was from a low of 0 APR's to a high of 8 APR's. Sessions 2 and 6 decelerated from 3 to 0 APR's and from 6 to 2 APR's respectively.

b) Sessions 8 to 9 resulted in a deceleration from 8 APR's to 2 APR's.

c) A horizontal trend resulted in sessions 9 to 15 (with the exception of session 11 which accelerated to 5 APR's); the range was from a high of 2 APR's to a low of 0 APR's. The mean was 1.2 APR's.

2) Trend analysis for Nancy's level one appropriate play responses during M-2 (*F*).

a) An erratic trend resulted during M-2, 8 out of 15 data points lie close to zero

but at 5 points (sessions 4, 5, 6, 12 and 14) the data increased to 11, 14, 12, 12 and 25 APR's respectively.

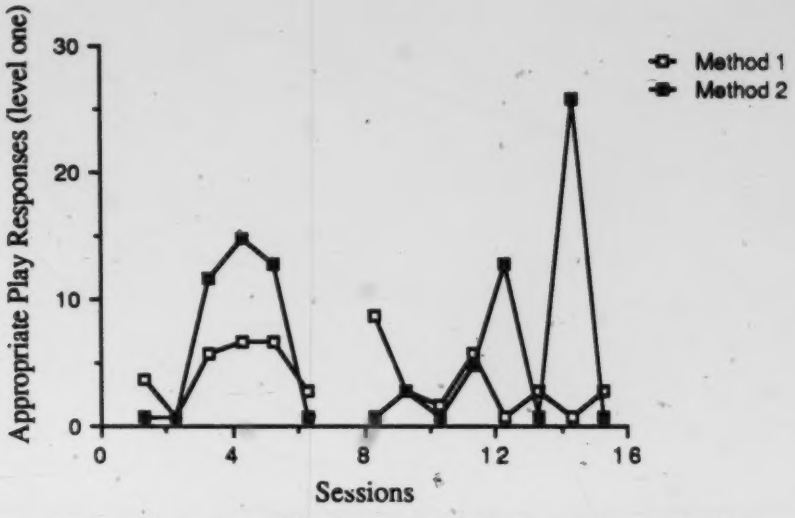


Figure 27. Comparison of Nancy's level one appropriate play responses during generalization phases *C* (M-1) and *F* (M-2). Level one appropriate play responses were defined as randomly performing a variety of steps in the sequence of steps for each game in an illogical order. A step was also classified as level one if it was performed incorrectly.

3) Comparison of Nancy's level one appropriate play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 5 points.

c) 7/14 M-1 data points are above M-2 data points.

d) 5/14 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Nancy's level one appropriate play responses during M-1 (*C*) and M-2 (*F*).

Given the erratic nature of the data, it cannot be concluded that either method is more effective. Therefore hypothesis 6, condition *F* will have more level one appropriate play responses than condition *C*, is not supported. However, during

five occasions M-2 resulted in greater numbers of level one appropriate behaviors than M-1 with an average magnitude of difference being 11.4 APR's.

Figure 28 shows Nancy's number of appropriate play responses (level two) during generalization phases *C* (M-1) and *F* (M-2).

Analysis of Figure 28

1) Trend analysis for Nancy's level two appropriate play responses during M-1 (*C*).

a) A general accelerating trend occurred during the first four sessions; the range was from a low of 0 APR's to a high of 55 APR's.

b) Session 5 resulted in a deceleration from 55 APR's to 3 APRs'.

c) The remaining sessions (sessions 6 to 15) resulted in an erratic performance; the range was from a low of 0 APR's to a high of 62 APR's. The mean was 19.2 APR's.

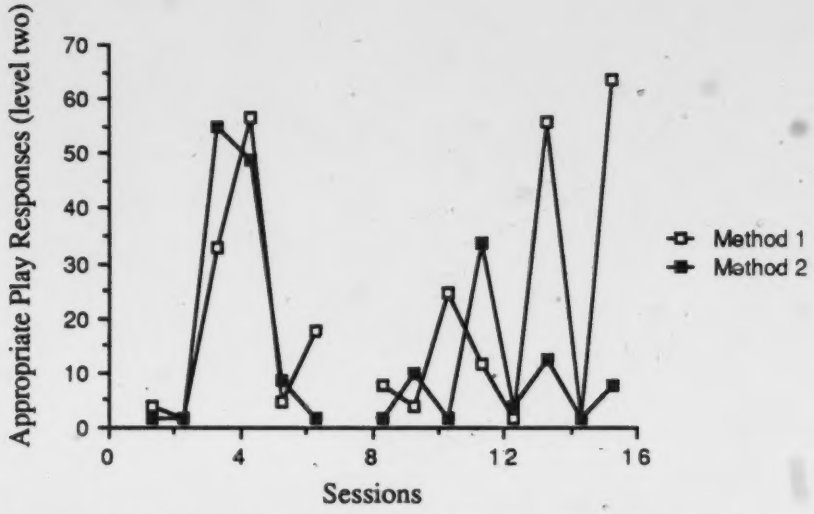


Figure 28. Comparison of Nancy's number of level two appropriate play responses during generalization phase C (M-1) and F (M-2). Level two appropriate play responses were defined as the linking together of two or more steps in the sequence of steps for each game. That is, the student had to carry out at least two steps in the proper sequence for each game before these steps would be classified as level two.

2) Trend analysis for Nancy's level two appropriate play responses during M-2 (*F*).

a) An accelerating trend was observed during the first three sessions; the range was from a low of 0 APR's to a high of 53 APR's.

b) A decelerating trend followed during sessions 3 to 8; the range was from a high of 53 APR's to a low of 0 APR's

c) A general horizontal trend resulted during sessions 9 to 14 (with exception of session 11 which accelerated from 0 to 32 APR's); the range was from a high of 11 APR's to a low of 0 APR's. The mean was 4.5 APR's.

3) Comparison of Nancy's level two appropriate play responses during M-1 (*C*) and M-2 (*F*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 6 points.

c) 7/14 M-1 data points are above M-2 data points.

d) 5/14 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Nancy's level two appropriate play responses during M-1 (*C*) and M-2 (*F*).

There is no significant difference between M-1 and M-2 with respect to Nancy's number of level two appropriate play responses during the generalization phases. Therefore, hypothesis 7, condition *F* will have more level two appropriate play responses than condition *C*, is not supported.

Figure 29 compares Andrew's duration of appropriate toy play responses during free play phases *D* (Method 1) and *G* (method 2).

Analysis of Figure 29

1) Trend analysis for Andrew's duration of appropriate toy play responses M-1 (*D*).

a) A decelerating trend was observed during sessions 1 to 6; the range was from a low of 0.0 minutes to a high of 1.37 minutes.

b) Sessions 6 to 7 resulted in an acceleration from 0.0 minutes to 2.57 minutes.

c) A deceleration from 2.57 minutes to .8 minutes occurred from session 7 to session 8.

d) Sessions 8 to 9 resulted in accelerations from .8 minutes to 1.8 minutes.

e) The last three sessions, 9 to 11, resulted in a decelerating trend; the range was from a high of 1.8 minutes to a low of .7 minutes.

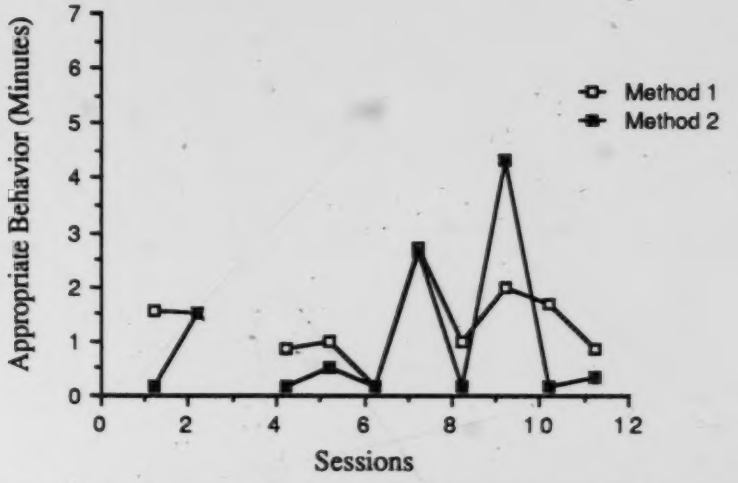


Figure 29. Comparison of Andrew's duration of appropriate toy play responses in minutes during free play phases *D* (Method 1) and *G* (Method 2). The generalization phase was carried out for seven minutes, therefore the maximum attainable duration of appropriate toy play responses equals seven minutes.

2) Trend analysis for Andrew's duration of appropriate toy play responses M-2 (*G*).

a) A general horizontal trend occurred throughout 7 of the 10 treatments; the range was with a low of 0 minutes to a high of 0.36 minutes.

b) Accelerating fluctuations occurred during sessions 2, 7 and 9 to 1.35, 2.45 and 4.16 minutes respectively.

3) Comparison of Andrew's duration of APR's during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 2 points.

c) 7/10 M-1 data points are above M-2 data points.

d) 2/10 M-2 data points are above M-1 data points.

4) Conclusion for Andrew's duration of appropriate toy play responses during M-1 (*D*) and M-2 (*G*).

M-1 fairly consistently resulted in a longer duration of appropriate behaviors than M-2. However, the magnitude of the difference was not very great and M-2 produced very erratic behaviors. Hypothesis 8, condition *G* will have a longer duration of appropriate toy play responses than condition *D*, is not supported.

Figure 30 compares Andrew's number of inappropriate behaviors during free play phases *D* (M-1) and *G* (M-2).

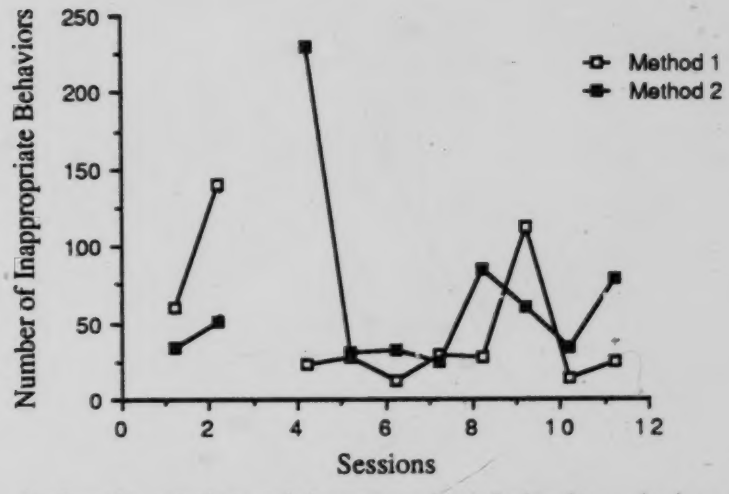


Figure 30. Andrew's number of inappropriate behaviors during the generalization phases *D* (Method 1) and *G* (Method 2). Number of inappropriate behaviors equals total number per seven minute sessions.

Analysis of Figure 30

1) Trend analysis for Andrew's number of inappropriate behaviors M-1 (*D*).

a) A general horizontal trend was observed during 7 out of 10 treaments (11 sessions); the range was from a high of 23 inappropriate behaviors to a low of 6 inappropriate behaviors. The mean was 16.6 inappropriate behaviors.

b) Sessions 1, 2, and 9 showed marked accelerations to 54, 135 and 106 inappropriate behaviors respectively.

2) Trend analysis for Andrew's number of inappropriate behaviors M-2 (*G*).

a) A general horizontal trend occurred during 6 of the 10 treatments (11 sessions); the range was from a low of 19 inappropriate behaviors to a high of 45 inappropriate behaviors. The mean was 28.5 inappropriate behaviors.

b) Sessions 4, 8, 9 and 11 showed accelerations of 223, 78, 54 and 73 inappropriate behaviors respectively.

3) Comparison of Andrew's number of inappropriate behaviors during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 4 points.

c) 6/10 M-1 data points are less than M-2 data points.

d) 4/10 M-2 data points are less than M-1 data points.

4) Conclusion for Andrew's number of inappropriate behaviors during phases M-1 (*D*) and M-2 (*G*).

There is no significant difference between M-1 and M-2 with respect to Andrew's number of inappropriate behaviors during free play phases *D* and *G*. Therefore hypothesis 9, condition *G* will have fewer inappropriate behaviors than in condition *D*, is not supported.

Figure 31 shows Andrew's number of appropriate play responses (level one)

during free play phases *D* (M-1) and *G* (M-2).

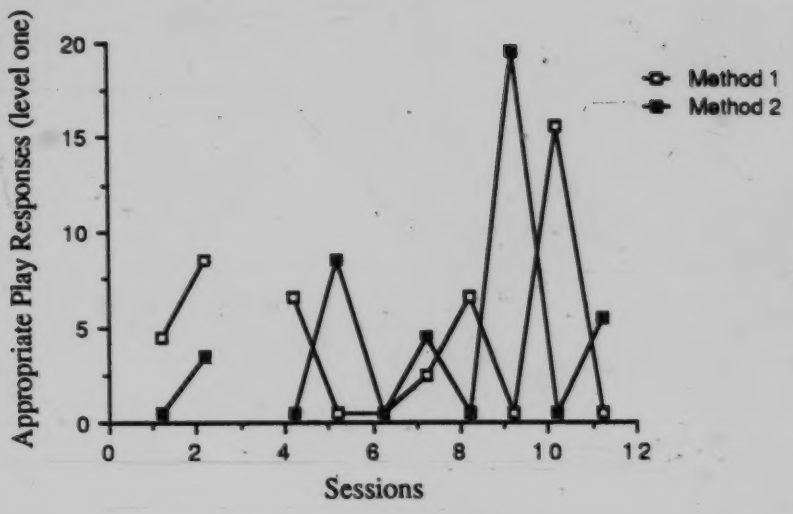


Figure 31. Comparison of Andrew's level one appropriate play responses during generalization phases *D* (M-1) and *G* (M-2). Level one appropriate play responses were defined as randomly performing a variety of steps in the sequence of steps for each game in an illogical order. A step was also classified as level one if it was performed incorrectly.

Analysis of Figure 31

1) Trend analysis for Andrew's level one appropriate play responses during M-1 (*D*).

a) A generally erratic performance was observed during the eleven sessions. The first two sessions resulted in an acceleration from 4 to 8 APR's.

b) Sessions 2 to 6 resulted in a decelerating trend; the range was from a high of 8 APR's to a low of 0 APR's.

c) Accelerations occurred during sessions 7, 8 and 10 to 2, 6 and 15 APR's respectively.

d) Decelerations occurred during sessions 9 and 11 to 0 APR's.

2) Trend analysis for Andrew's level one appropriate play responses during M-2 (*G*).

a) A general horizontal trend was observed during 8 out of 10 treatments (11

sessions); the range was from a low of 0 APR's to a high of 5 APR's with a mean of 1.5.

b) Sessions 5 and 9 showed marked accelerations to 8 and 19 APR's respectively.

3) Comparison of Andrew's level one appropriate play responses during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 5 points.

c) 5/10 M-1 data points are above M-2 data points.

d) 4/10 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Andrew's level one appropriate play responses during M-1 (*D*) and M-2 (*G*).

The mean magnitude of the difference where M-1 is greater than M-2 is 7.2 APR's. The mean magnitude of the difference where M-2 is greater than M-1 is 8.5 APR's. There is no significant differecence between M-1 and M-2. Therefore, hypothesis 10, condition *G* will have more level one appropriate play responses than condition *D*, is not supported.

Figure 32 shows Andrew's number of appropriate play responses (level two) during free play phases *D* (M-1) and *G* (M-2).

Analysis of Figure 32

1) Trend analysis for Andrew's level two appropriate play responses during M-1 (*D*).

a) M-1 resulted in a generally erratic trend. During the first two sessions, a deceleration occurred from 9 to 0 APR's.

b) Sessions 4 and 5 resulted in an acceleration from 0 to 7 APR's, followed by a deceleration to 0 APR's during session 6.

c) A marked acceleration occurred during sessions 6 and 7 from 0 to 41 APR's, followed by a deceleration to 0 APR's during session 8.

d) An accelerating trend was observed during sessions 8 to 10; the range was from a low of 0 APR's to a high of 39 APR's.

e) The last two sessions (sessions 10 and 11) resulted in a deceleration from 39 to 13 APR's.

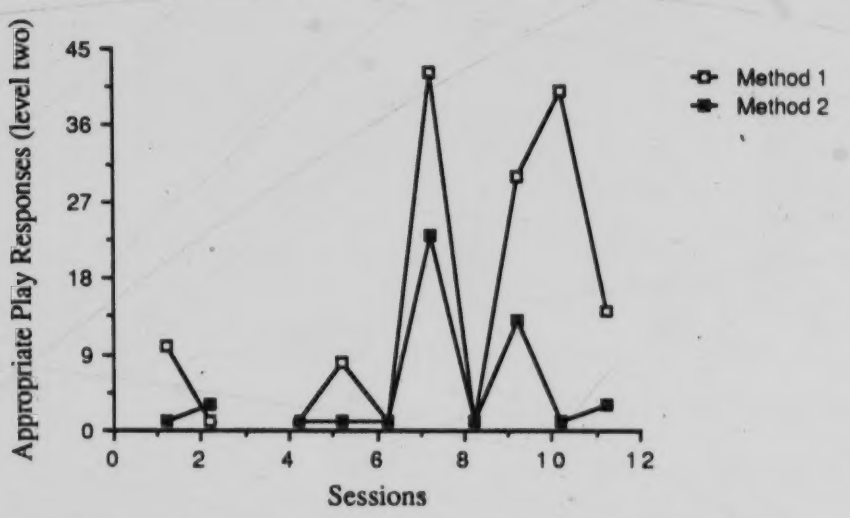


Figure 32. Comparison of Andrew's number of level two appropriate play responses during free play phases *D* (M-1) and *G* (M-2). Level two appropriate play responses were defined as the linking together of two or more steps in the sequence of steps for each game. That is, the student had to carry out at least two steps in the proper sequence with each game before these steps would be classified as level two.

2) Trend analysis for Andrew's level two appropriate play responses during M-2 (*G*).

a) A general horizontal trend was observed during 8 out of 10 treatments (11 sessions); the range was from a low of 0 APR's to a high of 2 APR's. The mean was 0.5 APRs.

b) Sessions 7 and 9 resulted in accelerations to 22 and 12 APR's respectively.

3) Comparison of Andrew's level two APR's during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 3 points.

b) M-1 and M-2 cross-over at 1 point.

c) 6/10 M-1 data points are above M-2 data points.

d) 1/10 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Andrew's level two APR's during M-1 (*D*) and M-2 (*G*).

M-1 fairly consistently resulted in more APR's than M-2. The mean magnitude of the difference, where M-1 was greater than M-2, was 17.0 APR's. Therefore,the comparison of M-1 and M-2 does not support hypothesis 11 (condition *G* will have more level two appropriate play responses than condition *D*).

Figure 33 compares Anne's duration of appropriate toy play responses during free play phases *C* (Method 1) and *F* (method 2).

Analysis of Figure 33

1) Trend analysis for Anne's duration of appropriate toy play responses M-1 (*D*).

a) A general accelerating trend was observed during sessions 1 to 4; the range was from a low of 0.17 minutes to a high of 2.82 minutes.

b) A deceleration occurred from session 4 to 6, from a high of 2.82 minutes to a low of .47 minutes.

c) A variable accelerating trend resulted during sessions 6 to 8; the range was from a low of 0.0 minutes to a high of 1.82 minutes.

d) A deceleration from 1.82 to 0.2 minutes occurred during sessions 9 and 10 followed by an acceleration of 0.2 to 1.42 minutes duirng sessions 10 to 11.

e) A general horizontal trend was observed during the last four sessions; the range was from a low of 0.8 minutes to a high of 1.42 minutes. The mean was 1.1 minutes.

2) Trend analysis for Anne's duration of appropriate toy play responses M-2 (*G*).

a) A general horizontal trend occurred in 11 of the 14 treatments; the range was

from a low of 0.0 minutes to a high of 1.58 minutes. The mean was 0.75 minutes.

b) Sessions 5, 7 and 13 showed accelerations to 4.92, 3.0 and 3.02 minutes respectively.

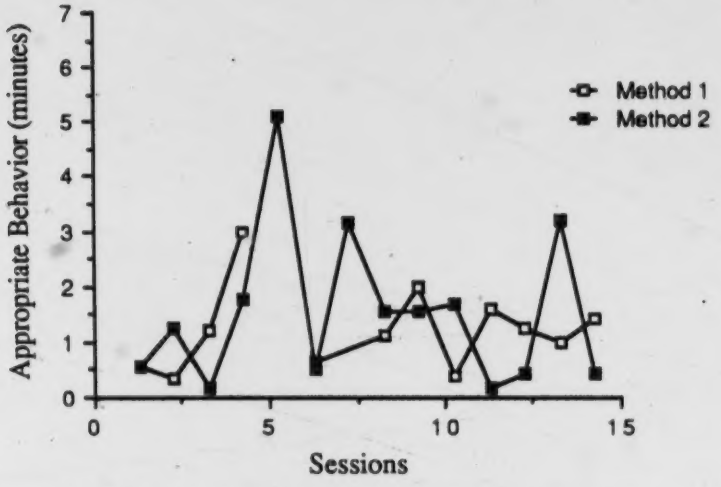


Figure 33. Comparison of Anne's duration of appropriate toy play responses in minutes during free play phases *D* (Method 1) and *G* (Method 2). The free play phase was carried out for seven minutes, therefore the maximum attainable duration of appropriate toy play responses were seven minutes.

3) Comparison of Anne's duration of appropriate toy play responses during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 6 points.

c) 7/13 M-1 data points are above M-2 data points.

d) 6/13 M-2 data points are above M-1 data points.

4) Conclusion for Anne's duration of appropriate toy play responses during M-1 (*D*) and M-2 (*G*).

There is no significant difference between M-1 and M-2 with respect to Anne's

duration of appropriate toy play responses during the free play phase. Therefore hypothesis 8, condition *G* will have a longer duration of appropriate toy play responses than condition *D*, is not supported.

Figure 34 compares Anne's number of inappropriate behaviors during free play phases *C* (M-1) and *F* (M-2).

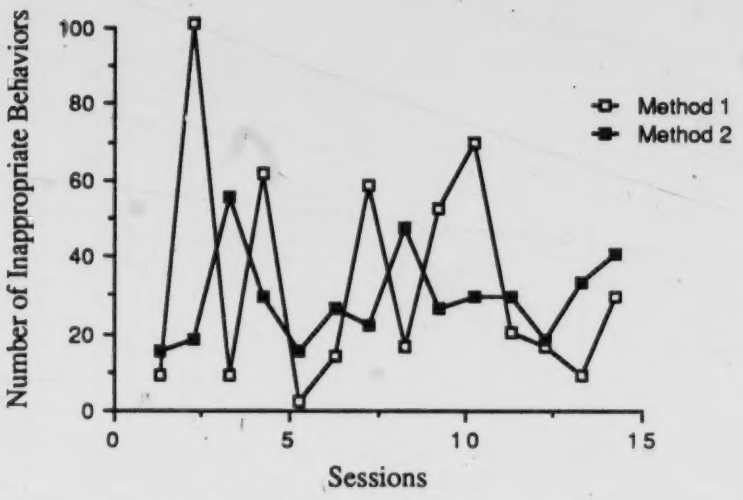


Figure 34. Anne's number of inappropriate behaviors during the free play phases *D* (Method 1) and *G* (Method 2). Number of inappropriate behaviors equals total number per seven minute session.

Analysis of Figure 34

1) Trend analysis for Anne's number of inappropriate behaviors M-1 (*D*).

a) Generally erratic behavior was observed during the first five sessions; the range was from a high of 99 inappropriate behaviors to a low of 0 inappropriate behaviors. The mean was 34.4 inappropriate behaviors.

b) An accelerating trend occurred during sessions 5 to 7; the range was from a low of 0 inappropriate behaviors to a high of 56 inappropriate behaviors.

c) Sessions 7 to 8 resulted in a deceleration from 56 to 14 inappropriate

behaviors followed by an accelerating trend during sessions 8 to 10; the range was from a low of 14 inappropriate behaviors to a high of 67 inappropriate behaviors.

d) A decelerating trend occurred during sessions 10 to 14; the range was from a high of 67 inappropriate behaviors to a low of 7 inappropriate behaviors.

e) The last two sessions resulted in accelerations from 7 to 27 inappropriate behaviors.

2) Trend analysis for Anne's number of inappropriate behaviors M-2 (*G*).

a) An accelerating trend was observed during the first three sessions; the range was from a low of 13 inappropriate behaviors to a high of 53 inappropriate behaviors.

b) A general horizontal trend occurred during 9 of the 11 remaining treatments; the range was from a low of 13 inappropriate behaviors to a high of 31 inappropriate behaviors. The mean was 23.2 inappropriate behaviors.

c) Sessions 8 and 14 resulted in accelerations to 45 and 38 inappropriate behaviors respectively.

3) Comparison of Anne's number of inappropriate behaviors during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 8 points.

c) 9/14 M-1 data points are less than M-2 data points.

d) 5/14 M-2 data points are less than M-1 data points.

4) Conclusion for Anne's number of inappropriate behaviors during phases M-1 (*D*) and M-2 (*G*).

Although 9 data points of M-1 are less than M-2, due to the erratic performance during M-1, the mean magnitude of the difference where M-1 was less than M-2

was only 17.0 inappropriate behaviors; where as, the mean magnitude of the difference for the M-2 points that were less than M-1 was 43.2 inappropriate behaviors. However, the 5 data points in M-2 that are less than M-1 do not provide sufficient evidence to support hypothesis 9 (condition *G* will have fewer inappropriate behaviors than in condition *D*).

Figure 35 shows Anne's number of appropriate play responses (level one) during free play phases *D* (M-1) and *G* (M-2).

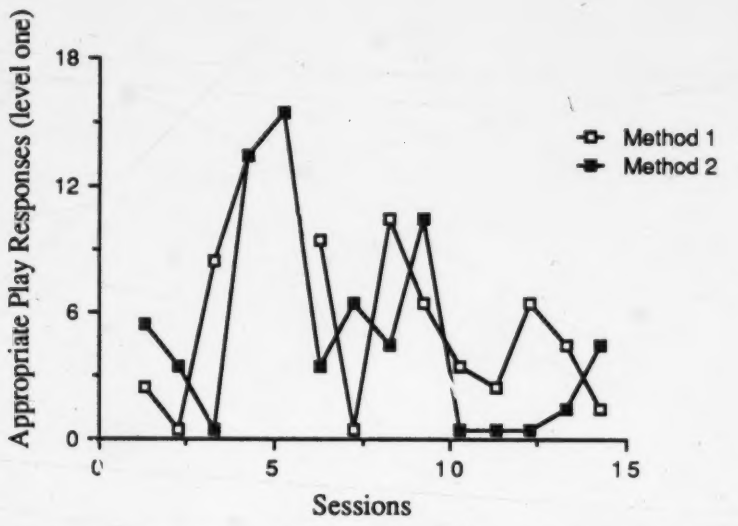


Figure 35. Comparison of Anne's level one appropriate play responses during free play phases *D* (M-1) and *G* (M-2). Level one appropriate play responses were defined as randomly performing a variety of steps in the sequence of steps for each game in an illogical order. A step was also classified as level one if it was performed incorrectly.

Analysis of Figure 35

1) Trend analysis for Anne's level one appropriate play responses during M-1 (*D*).

a) A general acceleration was observed during the first four sessions; the range was from a low of 0.0 APR's to a high of 13 APR's.

b) A deceleration occurred from sessions 4 to 7; the range was from a high of 13

APR's to a low of 0.0 APR's.

c) An acceleration from 0.0 to 10 APR's resulted from session 7 to 8 followed by decelerations during sessions 8 to 11; the range was from a high of 10 APR's to a low of 2 APR's.

d) An acceleration from 2 APR's to 6 APR's was observed during sessions 11 to 12.

e) A decelerating trend occurred during the last three sessions; the range was from a high of 6 APR's to a low of 1 APR.

2) Trend analysis for Anne's level one appropriate play responses during M-2 (*G*).

a) A decelerating trend was observed during sessions 1 to 3; the range was from a high of 5 APR's to a low of 0 APR's.

b) An accelerating trend occurred during sessions 3 to 5; the range was from a low of 0 APR's to a high of 15 APR's.

c) A deceleration from 15 APR's to 3 APR's occurred during sessions 5 to 6.

d) An accelerating trend resulted during sessions 6 to 9; the range was from a low of 3 APR's to a high of 10 APR's.

e) A deceleration from 10 APR's to 0 APR's occurred during sessions 9 to 10 followed by a horizontal trend during sessions 10 to 12 (with a range of 0 APR's).

f) The last three sessions resulted in an accelerating trend; the range was from a low of 0 APR's to a high of 4 APR's.

3) Comparison of Anne's level one appropriate play responses during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 cross-over at 6 points.

c) 7/13 M-1 data points are above M-2 data points.

d) 5/13 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Anne's level one appropriate play responses during M-1 (*D*) and M-2 (*G*).

There is no significant difference between M-1 and M-2 with respect to Anne's number of level one appropriate play responses during free play sessions. Therefore, hypothesis 10, conditon *G* will have more level one appropriate play responses than condition *D*, is not supported.

Figure 36 shows Anne's number of appropriate play responses (level two) during free play phases *D* (M-1) and *G* (M-2).

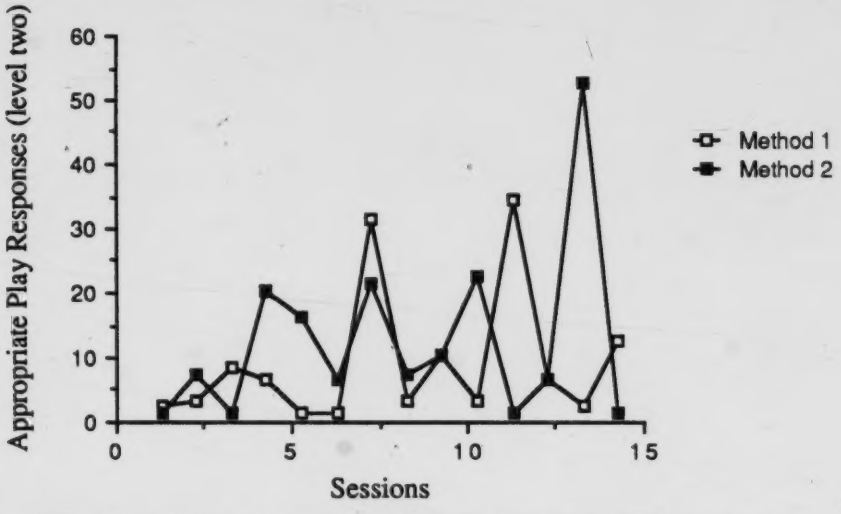


Figure 36. Comparison of Anne's number of level two appropriate play responses during free play phases *D* (M-1) and *G* (M-2). Level two appropriate play responses were defined as the linking together of two or more steps in the sequence of steps for each game. That is, the student had to carry out at least two steps in the proper sequence for each game before these steps would be classified as level two.

Analysis of Figure 36

1) Trend analysis for Anne's level two appropriate play responses during M-1 (*D*).

a) A variable horizontal trend occurred during 10 out of 13 treatments; the range

was from a low of 0 APR's to a high of 9 APR's. The mean was 3.4 APR's.

b) Accelerations occurred during sessions 7, 11, and 14 to 30, 33 and 11 APR's respectively.

2) Trend analysis for Anne's level two appropriate play responses during M-2 (*G*).

a) An acceleration from 0 to 6 APR's was observed from session 1 to 2 followed by a deceleration to 0 APR's during session 3.

b) An acceleration from 0 to 19 APR's occurred during sessions 3 and 4 followed by a variable horizontal trend during sessions 4 to 10; the range was from a low of 5 APR's to a high of 21 APR's. The mean was 13.6 APRs.

c) During sessions 10 to 11 a deceleration occurred from 21 APR's to 0 APR's.

d) An acceleration was observed during treatments 11 to 13; the range was from a low of 0 APR's to a high of 51 APR's.

e) The last two sessions resulted in a deceleration from 51 APR's to 0 APR's.

3) Comparison of Anne's level two appropriate play responses during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 8 points.

c) 5/13 M-1 data points are above M-2 data points.

d) 6/13 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Anne's level two appropriate play responses during M-1 (*D*) and M-2 (*G*).

There is no significant difference between M-1 and M-2 with respect to Anne's number of level two appropriate play responses. Therefore, hypothesis 11, condition *G* will have more level two appropriate play responses than condition *D*, is not supported.

Figure 37 compares Irene's number of inappropriate behaviors during free play

phases *D* (M-1) and *G* (M-2).

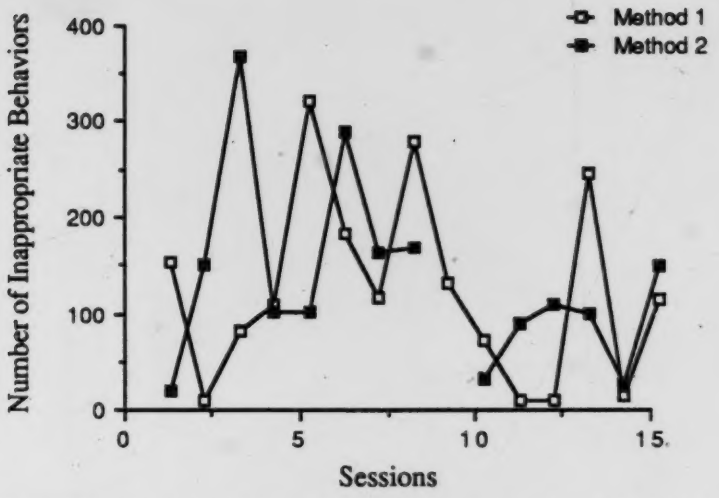


Figure 37. Irene's number of inappropriate behaviors during the free play phases *D* (Method 1) and *G* (Method 2). Number of inappropriate behaviors equals total number per seven minute sessions.

Analysis of Figure 37

1) Trend analysis for Irene's number of inappropriate behaviors M-1 (*D*).

a) Sessions 1 and 2 resulted in a deceleration from 142 inappropriate behaviors to 1 inappropriate behavior.

b) An accelerating trend occurred during sessions 2 to 5; the range was from a low of 1 inappropriate behavior to a high of 310 inappropriate behaviors.

c) A decelerating trend resulted during treatments 5 to 7; the range was from a high of 310 inappropriate behaviors to a low of 105 inappropriate behaviors.

d) An acceleration was observed from session 7 to 8 from 105 to 269 inappropriate behaviors.

e) During sessions 8 to 12 a decelerating trend occurred; the range was from a high of 269 inappropriate behaviors to a low of 0 inappropriate behaviors.

f) Fluctuating data resulted during the last three sessions, with inappropriate behaviors totalling 235, 6 and 104 respectively.

2) Trend analysis for Irene's number of inappropriate behaviors M-2 (*G*).

a) A accelerating trend occurred during the first three sessions; the range was from a low of 10 inappropriate behaviors to a high of 359 inappropriate behaviors.

b) A deceleration was observed from sessions 3 to 5 from a high of 359 inappropriate behaviors to a low of 91 inappropriate behaviors.

c) An acceleration occurred from sessions 5 to 6 from 91 to 279 inappropriate behaviors.

d) A decelerating trend resulted during sessions 6 to 10; the range was from a high of 279 inappropriate behaviors to a low of 22 inappropriate behaviors.

e) An accelerating trend occurred from sessions 10 to 13; the range was from a low of 22 inappropriate behaviors to a high of 98 inappropriate behaviors.

f) Fluctuating data resulted during the last three sessions, with inappropriate behaviors totalling 90, 18 and 138 respectively.

3) Comparison of Irene's number of inappropriate behaviors during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 5 points.

c) 8/14 M-1 data points are less than M-2 data points.

d) 6/14 M-2 data points are less than M-1 data points.

4) Conclusion for Irene's number of inappropriate behaviors during phases M-1 (*D*) and M-2 (*G*).

There is no significant difference between M-1 and M-2 with respect to Irene's number of inappropriate behaviors during generalization phases *D* and *G*.

Therefore hypothesis 9, condition *G* will have fewer inappropriate behaviors than in condition *D*, is not supported.

Figure 38 compares Nancy's duration of appropriate toy play responses during free play phases *D* (Method 1) and *G* (method 2).

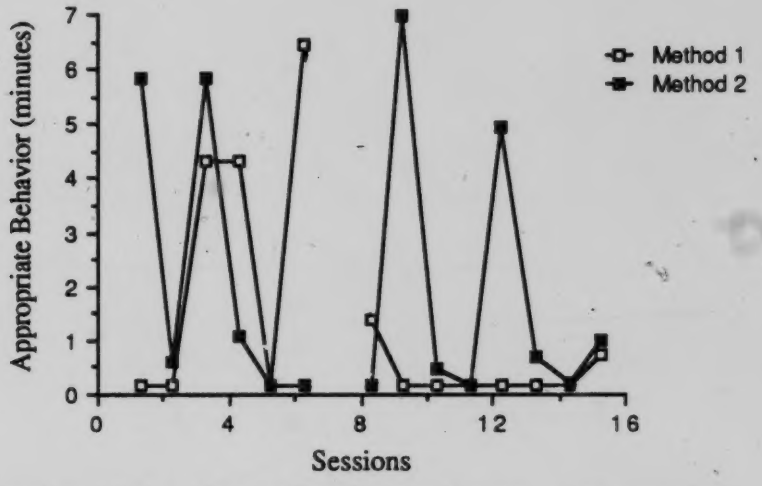


Figure 38. Comparison of Nancy's duration of appropriate toy play responses in minutes during free play phases *D* (Method 1) and *G* (Method 2). The free play phase was carried out for seven minutes, therefore the maximum attainable duration of appropriate toy play responses were seven minutes.

Analysis of Figure 38

1) Trend analysis for Nancy's duration of appropriate toy play responses M-1 (*D*).

a) A horizontal trend was observed during 9 out of 14 treatments with a range of 0 minutes.

b) Sessions 3, 4, 6, 7, and 14 accelerated to 4.14, 4.16, 6.27, 1.20 and 0.58 minutes respectively.

2) Trend analysis for Nancy's duration of appropriate toy play responses M-2 (*G*).

a) A general horizontal trend occurred throughout 10 of the 14 treatments; the range was from a low of 0 minutes to a high of .9 minutes. The mean was 0.29

minutes.

b) Treatments 1, 3, 8 (session 9) and 11 (sessions 12) accelerated to 5.68, 5.67, 6.77 and 4.77 minutes respectively.

3) Comparison of Nancy's duration of appropriate toy play responses during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 2 points.

c) 3/14 M-1 data points are above M-2 data points.

d) 9/14 M-2 data points are above M-1 data points.

4) Conclusion for Nancy's duration of appropriate toy play responses during M-1 (*D*) and M-2 (*G*).

The mean magnitude of the difference where M-2 is greater than M-1(9 out of 14 data points) was 2.25 minutes. The difference between M-2 and M-1 supports hypothesis 8 (condition *G* will have a longer duration of appropriate toy play responses than condition *D*).

Figure 39 compares Nancy's number of inappropriate behaviors during free play phases *D* (M-1) and *G* (M-2).

Analysis of Figure 39

1) Trend analysis for Nancy's number of inappropriate behaviors M-1 (*D*).

a) An accelerating trend was observed during sessions 1 to 3; the range was from a low of 15 inappropriate behaviors to a high of 29 inappropriate behaviors.

b) A horizontal trend occurred throughout sessions 4 to 15 with the exception of sessions 6, 11 and 15; the range was from a low of 0 inappropirate behaviors to a high of 6 inappropriate behaviors.

c) Sessions 6, 11 and 15 resulted in accelerations of inappropriate behaviors to 11, 24 and 10 respectively.

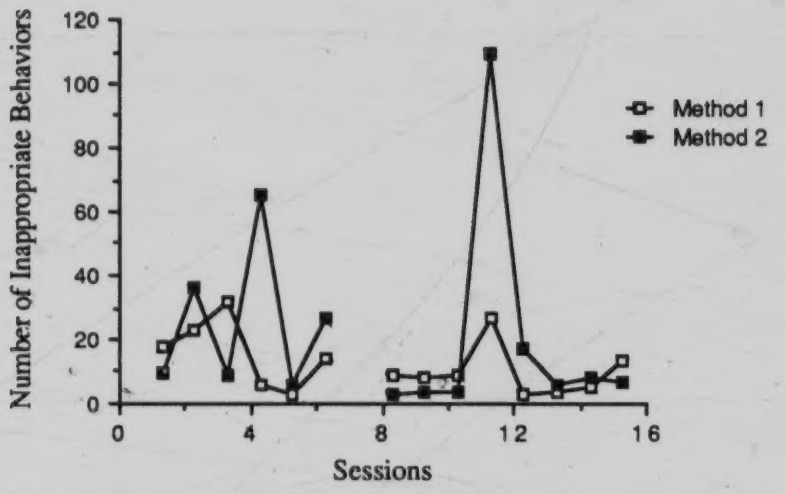


Figure 39. Nancy's number of inappropriate behaviors during the free play phases *D* (M-1) and *G* (M-2). Number of inappropriate behaviors equals total number per seven minute sessions.

2) Trend analysis for Nancy's number of inappropriate behaviors M-2 (*G*).

a) During the first four sessions, fluctuations resulted in 7, 33, 6 and 62 inappropriate behaviors occurring respectively.

b) During 7 out of the 10 remaining sessions a horizontal trend occurred; the range was from a low of 0 inappropriate behaviors to a high of 5 inappropriate behaviors.

c) *Sessions 6, 11 and 12 resulted in accelerations to* 24, 106, and 14 inappropriate behaviors respectively.

3) Comparison of Nancy's number of inappropriate behaviors during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 5 points.

c) 8/14 M-1 data points are less than M-2 data points.

d) 6/14 M-2 data points are less than M-1 data points.

4) Conclusion for Nancy's number of inappropriate behaviors during phases M-1 (*D*) and M-2 (*G*).

Although only 2 data points of M-1 fall below M-2, the mean magnitude of the difference where M-1 is less than M-2 was 23.6 inappropriate behaviors; whereas, the mean magnitude of the difference where M-2 is less than M-1 is only 8.6 inappropriate behaviors. Therefore, on occasion M-1 results in fewer inappropriate behaviors than M-2. This data does not support hypothesis 9 (condition *G* will have fewer inappropriate behaviors than in condition *D*).

Figure 40 shows Nancy's number of appropriate play responses (level one) during free play phases *D* (M-1) and *G* (M-2).

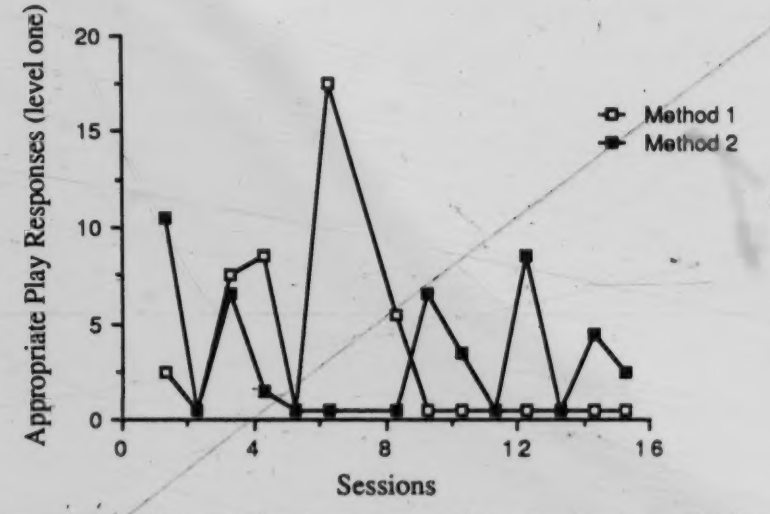


Figure 40. Comparison of Nancy's level one appropriate play responses during free play phases *D* (M-1) and *G* (M-2). Level one appropriate play responses were defined as randomly performing a variety of steps in the sequence of steps for each game in an illogical order. A step was also classified as level one if it was performed incorrectly.

Analysis of Figure 40

1) Trend analysis for Nancy's level one appropriate play responses during M-1 (*D*).

a) An accelerating trend was observed during the first four sessions; the range was from a low of 0 APR's to a high of 8 APR's.

b) A deceleration occurred from session 4 to 5 from 8 APR's to 0 APR's followed by an acceleration during session 6 to 17 APR's.

c) A decelerating trend was observed during sessions 6 to 9; the range was from a high of 17 APR's to a low of 0 APR's.

e) Sessions 9 to 15 remained at 0 APR's.

2) Trend analysis for Nancy's level one appropriate play responses during M-2 (*G*).

a) During sessions 1 and 2, a deceleration was observed from 10 APR's to 0 APR's.

b) Session 3 resulted in an acceleration in APR's from 0 to 6 APR's followed by a decelerating trend which stabalized at 0 APR's till session 8.

c) Fluctuating data occurred during the last 7 sessions; the range was from a low of 0 APR's to a high of 8 APR's. The mean was 3.28 APR's.

3) Comparison of Nancy's level one appropriate play responses during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 4 points.

b) M-1 and M-2 cross-over at 1 point.

c) 4/14 M-1 data points are above M-2 data points.

d) 6/14 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Nancy's level one appropriate play responses during M-1 (*D*) and M-2 (*G*).

The magnitude of the difference between M-2 and M-1 was not significant, therefore there was no significant difference between M-1 and M-2. Hypothesis

10, condition *G* will have more level one appropriate play responses than condition *D*, was not supported.

Figure 41 shows Nancy's number of appropriate play responses (level two) during free play phases *D* (M-1) and *G* (M-2).

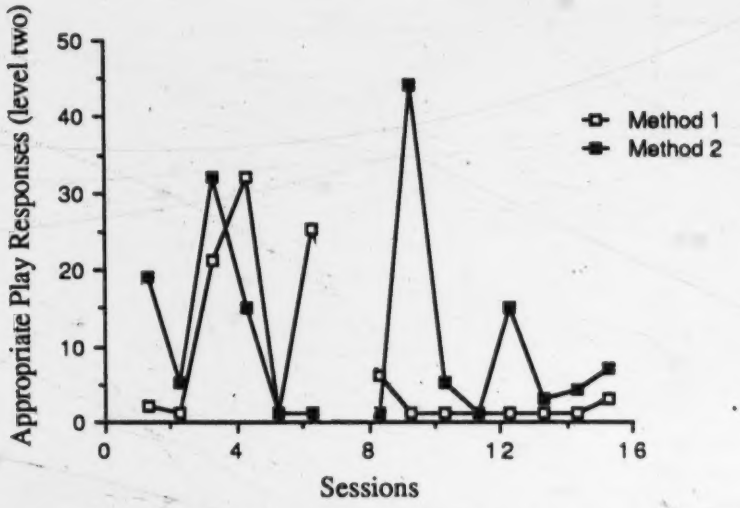


Figure 41. Comparison of Nancy's number of level two appropriate play responses during free play phases *D* (M-1) and *G* (M-2). Level two appropriate play responses were defined as the linking together of two or more steps in the sequence of steps for each game. That is, the student had to carry out at least two steps in the proper sequence for each game before these steps would be classified as level two.

Analysis of Figure 41

1) Trend analysis for Nancy's level two appropriate play responses during M-1 (*D*).

a) An accelerating trend resulted during the first four sessions; the range was from a low of 0 APR's to a high of 31 APR's.

b) Session 5 resulted in a deceleration from 31 APR's to 0 APR's followed by an acceleration to 24 APR's during session 6.

c) A decelerating trend was observed during sessions 6 to 8; the range was from

a high of 24 APR's to a low of 0 APR's.

d) A horizontal trend occurred during the remaining sessions; the range was from a high of 2 APR's to a low of 0 APR's.

2) Trend analysis for Nancy's level two appropriate play responses during M-2 (*G*).

a) Fluctuating data resulted during the first three sessions with 18, 4 and 31 APR's occurring respectively.

b) A decelerating trend was observed during sessions 3 to 5; the range was from a high of 31 APR's to a low of 0 APR's.

c) A variable horizontal trend occurred throughout 8 of the remaining 10 treatments (sessions 5 to 15); the range was from a high of 6 APR's to a low of 0 APR's. The mean was 1.88 APR's.

d) Sessions 9 and 12 resulted in accelerations in APR's to 43 and 14 respectively.

3) Comparison of Nancy's level two appropriate play responses during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 2 points.

c) 3/14 M-1 data points are above M-2 data points.

d) 9/14 M-2 data points are above M-1 data points.

4) Conclusion for the comparison of Nancy's level two appropriate play responses during M-1 (*D*) and M-2 (*G*).

The average magnitude of the difference where M-2 was greater than M-1 was 15 APR's, therefore M-2 resulted in more level two appropriate play responses than M-1. Hypothesis 11, condition *G* will have more level two appropriate play responses than condition *D*, is supported.

Figure 42 compares Andrew's number of level one and level two appropriate toy play responses combined during free play phases *D* (Method 1) and *G* (Method 2).

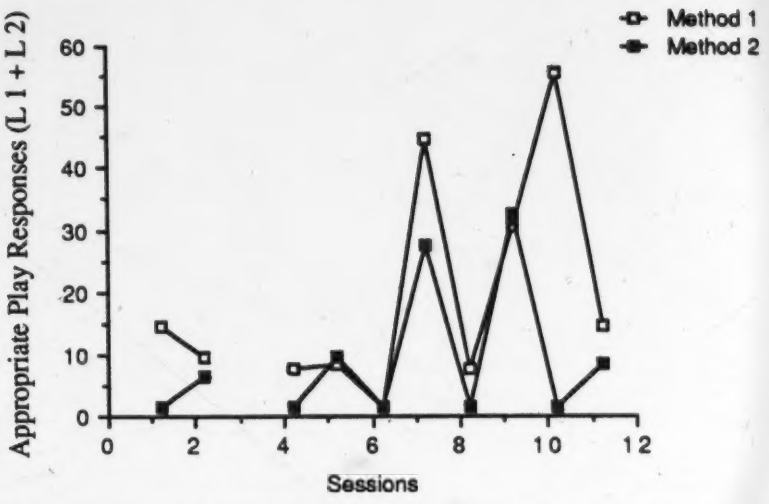


Figure 42. Comparison of Andrew's number of level one and level two appropriate toy play responses combined during free play phases *D* (Method 1) and *G* (Method 2).

Analysis of Figure 42

1) Trend analysis for Andrew's number of appropriate toy play responses (level one plus level two) during M-1 (*D*).

a) A decelerating trend occurred during the first six sessions; the range was from a high of 13 APR's to a low of 0 APR's.

b) Session 6 and 7 resulted in accelerations from 0 to 43 APR's followed by a deceleration during session 8 from 43 to 6 APR's.

c) Session 8 to 10 resulted in an accelerating trend; the range was from a low of 6 APR's to a high of 54 APR's. A deceleration followed during session 11 from 54 APR's to 13 APR's.

2) Trend analysis for Andrew's number of appropriate toy play responses (level one plus level two) during M-2 (*G*).

a) A variable horizontal trend occurred during 8 of the 10 sessions; the range was from a low of 0 APR's to a high of 8 APR's. The mean was 2.5 APR's.

b) Sessions 7 and 9 resulted in accelerations to 26 and 31 respectively.

3) Comparison of Andrew's number of appropriate toy play responses (level one plus level two) during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 1 point.

b) M-1 and M-2 do not cross-over.

c) 7/10 M-1 data points are above M-2 data points.

d) 2/10 M-2 data points are above M-1 data points.

4) Conclusion for Andrew's number of appropriate toy play responses (level one plus level two) during M-1 (*D*) and M-2 (*F*).

The average magnitude of the difference where M-1 was greater than M-2 was 15 APR's, therefore M-1 resulted in more APR's (level one plus level two) when compared to M-2. Hypothesis 12, condition *G* will have more level one and level two appropriate play responses combined than in condition *D*, is not supported.

Figure 43 compares Anne's number of level one and level two appropriate toy play responses combined during free play phases *D* (Method 1) and *G* (method 2).

Analysis of Figure 43

1) Trend analysis for Anne's number of appropriate toy play responses (level one plus level two) during M-1 (*D*).

a) A variable accelerating trend was observed during sessions 1 to 7; the range was from a low of 2 APR's to a high of 18 APR's.

b) A variable decelerating trend occurred during sessions 7 to 10; the range was from a high of 30 APR's to a low of 5 APR's.

c) Fluctuating data resulted during sessions 10 to 14 with values of 5, 35, 11, 5 and 12 APR's occurring respectively.

2) Trend analysis for Anne's number of appropriate toy play responses (level one plus level two) during M-2 (*G*).

a) Fluctuating data occurred throughout all 14 sessions; the range was from a low of 0 APR's to a high of 52 APR's. The mean was 14.73 APR's.

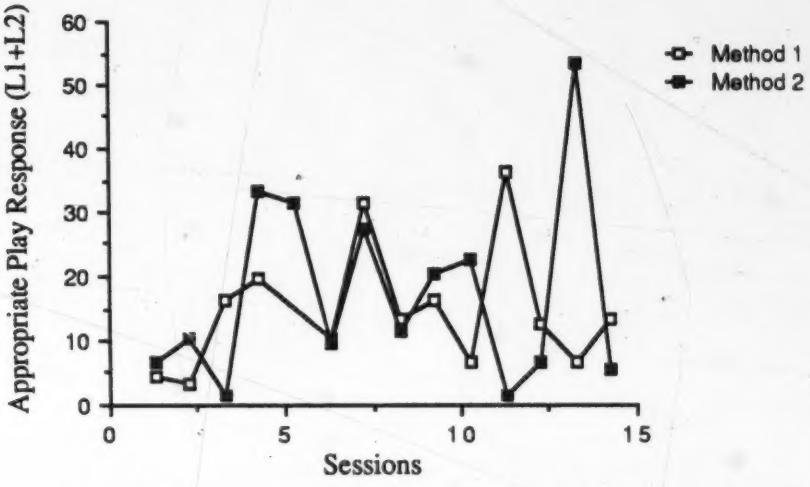


Figure 43. Comparison of Anne's number of level one and level two appropriate toy play responses combined during free play phases *D* (Method 1) and *G* (Method 2).

3) Comparison of Anne's number of appropriate toy play responses (level one plus level two) during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 do not coincide.

b) M-1 and M-2 cross-over at 6 points.

c) 7/13 M-1 data points are above M-2 data points.

d) 6/13 M-2 data points are above M-1 data points.

4) Conclusion for Anne's number of appropriate toy play responses (level one plus level two) during M-1 (*D*) and M-2 (*F*).

The mean magnitude of the difference where M-1 was greater than M-2 was 10.14

APR's. The mean magnitude of the difference where M-2 was greater than M-1 was 14.67 APR's. There was no significant difference between M-1 and M-2 with respect to Anne's number of level one and level two appropriate play responses combined during the free play sessions. Therefore, hypothesis 12, condition *G* will have more level one and level two appropriate toy play responses combined than in condition *D*, is not supported.

Figure 44 compares Nancy's number of level one and level two appropriate toy play responses combined during free play phases *D* (Method 1) and *G* (Method 2).

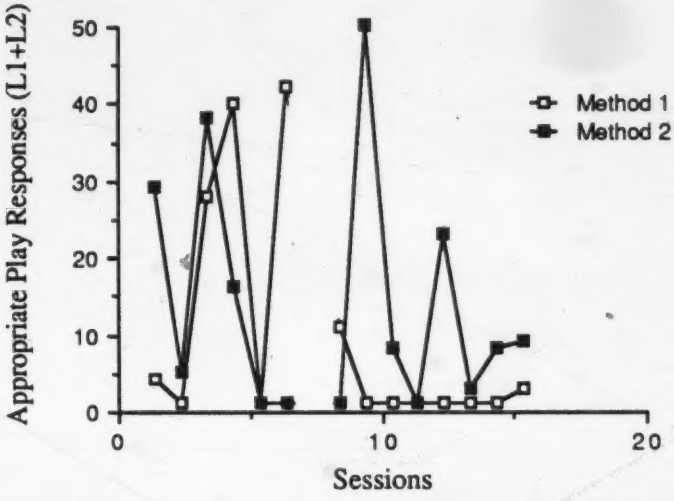


Figure 44. Comparison of Nancy's number of level one and level two appropriate toy play responses combined during free play phases *D* (Method 1) and *G* (Method 2).

Analysis of Figure 44

1) Trend analysis for Nancy's number of appropriate toy play responses (level one plus level two) during M-1 (*D*).

a) A horizontal trend was observed during 10 out of 14 sessions; the range was from a low of 0 APR's to a high of 3 APR's.

b) Accelerations occurred during sessions 3, 4, 6 and 8 to 27, 39, 41 and 10 APR's respectively.2) Trend analysis for Nancy's number of appropriate toy play responses (level one plus level two) during M-2 (*G*).

a) Fluctuating data resulted during the first four sessions; the range was from a high of 37 APR's to a low of 4 APR's. The mean was 21 APR's.

b) A general horizontal trend occurred throughout 8 of the 10 remaining sessions (sessions 5 to 15); the range was from a low of 0 APR's to a high of 8 APR's. The mean was 3 APR's.

c) Sessions 9 and 12 resulted in accelerations to 49 and 22 APR's respectively.

3) Comparison of Nancy's number of appropriate toy play responses (level one plus level two) during M-1 (*D*) and M-2 (*G*).

a) M-1 and M-2 coincide at 2 points.

b) M-1 and M-2 cross-over at 2 points.

c) 3/14 M-1 data points are above M-2 data points.

d) 9/14 M-2 data points are above M-1 data points.

4) Conclusion for Nancy's number of appropriate toy play responses (level one plus level two) during M-1 (*D*) and M-2 (*F*).

The average magnitude of the difference where M-2 is greater than M-1 was 14.67 APR's. Therefore, M-2 resulted in higher level one and level two appropriate play responses combined during Nancy's free play sessions. Hypothesis 12, condition *G* will have more level one and level two appropriate toy play responses combined than in condition *D*, is supported.

Table 4 illustrates which games each student played with during generalization and free play phases. During the generalization phase *C* (Method 1), Andrew played with the View-Master, Simon game and Perfection game during 1/10, 1/10 and 5/10 sessions respectively. During the generalization phase *F* (Method 2), Andrew played

Session	Andrew			Anne			Irene			Nancy		
	Method	G	FP	Method	G	FP	Method	G	FP	Method	G	FP
1	M-2	VP	x	M-2	VP	S	M-1	x	x	M-1	V	x
2	M-1	x	VP	M-2	SP	P	M-1	x	x	M-2	x	PSV
3	M-2	S	P	M-2	PV	P	M-1	x	x	M-1	x	x
4	M-1	S P	P	M-1	x	x	M-2	P	x	M-2	V	x
5	M-1	a	a	M-1	x	x	M-2	x	x	M-1	V	V
6	M-2	a	a	M-1	V	VP	M-2	x	x	M-1	PVS	PVS
7	M-1	P	P	M-2	PV	PV	M-1	x	x	M-2	SVP	PSV
8	M-1	x	P	M-1	P	PS	M-2	x	V	M-2	SVP	V
9	M-1	x	x	M-2	PV	PV	M-1	P	x	M-2	SV	x
10	M-2	x	x	M-1	a	a	M-2	V	x	M-1	S	x
11	M-2	x	S	M-1	V	P	M-2	x	x	M-1	P	PVS
12	M-2	V	x	M-1	VP	x	M-2	x	x	M-2	x	x
13	M-2	x	P	M-2	PS	V	M-1	x	x	M-2	a	a
14	M-1	P	V	M-2	PV	VS	M-1	x	x	M-1	a	a
15	M-1	x	P	M-1	S	PVS	M-2	x	x	M-2	x	x
16	M-2	x	x	M-2	V	VP	M-1	P	x	M-1	S	SV
17	M-1	P	VP	M-1	PV	PS	M-2	a	a	M-2	P	SVP
18	M-2	VP	P	M-2	V	VP	M-1	x	x	M-1	V	x
19	M-1	P	V	M-1	V	P	M-2	V	x	M-1	P	x
20	M-1	V	V	M-2	PV	PV	M-1	P	x	M-2	x	V
21	M-2	x	x	M-2	VP	x	M-1	x	x	M-2	V	x
22	M-2	SP	S	M-1	VP	SP	M-2	x	x	M-1	S	x
23	M-1	a	a	M-1	VP	V	M-2	x	x	M-1	x	x
24	M-1	a	a	M-2	SV	V	M-1	x	x	M-2	P	P
25	M-2	a	a	M-2	VS	VS	M-1	x	x	M-1	PV	x
26	M-1	a	a	M-1	V	VS	M-2	V	x	M-1	x	x
27	M-2	a	a	M-2	SV	VS	M-1	x	x	M-2	P	x
28	M-1	a	a	M-1	V	PV	M-2	x	x	M-2	V	V
29	M-1	a	a	M-1	a	a	M-2	x	x	M-1	SVP	V
30	M-2	a	a	M-2	a	a	M-1	x	x	M-2	P	S

Table 4. Tabulation of the games each student interacted with during generalization and free play phases. Note: G = Generalization Phase, FP = Free Play Phase, M-1 = Method (intervention) 1, M-2=Method (intervention) 2, S = Simon game, P= Perfection game, V = View-Master game, x = student did not interact with games, a = student was absent during session.

with the View-Master, Simon game and Perfection game during 3/10, 2/10 and 3/10 sessions respectively. During the free play phase *D* (Method 1), Andrew play with the View-Master, Simon game and Perfection game during 5/10, 0/10 and 6/10 sessions respectively. During the free play phase *G* (Method 2), Andrew played with the View-Master, Simon game and Perfection game during 0/10, 2/10 and 3/10 sessions respectively. Taking all sessions into consideration, Andrew played with the Perfection game the most and the Simon game the least.

During the generalization phase *C* (Method 1), Anne played with the View-Master, Simon game and Perfection game during 9/14, 1/14 and 4/14 sessions respectively. During the generalization phase *F* (Method 2), Anne played with the View-Master, Simon game and Perfection game during 12/14, 5/14 and 9/14 sessions respectively. During the free play phase *D* (Method 1), Anne play with the View-Master, Simon game and Perfection game during 5/14, 5/14 and 8/14 sessions respectively. During the free play phase *G* (Method 2), Anne played with the View-Master, Simon game and Perfection game during 10/14, 4/14 and 7/14 sessions respectively. Taking all sessions into consideration, Anne played with the View-Master game the most and the Simon game the least.

During the generalization phase *C* (Method 1), Irene did not play with the View-Master or Simon game, however Irene played with the Perfection game during 3/15 sessions. During the generalization phase *F* (Method 2), Irene did not play with the Simon game but played with the View-Master and Perfection game during 3/14 and 1/14 sessions respectively. During the free play phase *D* (Method 1), Irene did not interact with any of the three games. During the free play phase *G* (Method 2), Irene only played with the View-Master during 1/14 sessions.

During the generalization phase *C* (Method 1), Nancy played with the View-Master, Simon game and Perfection game during 6/14, 5/14 and 5/14 sessions

respectively. During the generalization phase *F* (Method 2), Nancy played with the View-Master, Simon game and Perfection game during 6/14, 3/14 and 6/14 sessions respectively. During the free play phase *D* (Method 1), Nancy play with the View-Master, Simon game and Perfection game during 5/14, 3/14 and 2/14 sessions respectively. During the free play phase *G* (Method 2), Nancy played with the View-Master, Simon game and Perfection game during 6/14, 4/14 and 4/14 sessions respectively. Taking all sessions into consideration, Nancy played with the View-Master game the most and the Simon game the least.

Chapter V

DISCUSSION

The increasing assistance procedure was an effective instructional procedure for teaching play skills to the four students in this study. That is, eighteen out of the twenty-four analyses conducted for the three games during the acquisition phase supported the increasing assistance procedure as an effective instructional strategy. As predicted, there was no difference between Method 1 and Method 2 with respect to the student's number of appropriate play responses during the acquisition phase. The six analyses which did not support the increasing assistance procedure involved instruction with the Simon game. The Simon game was the most difficult game for the students to master. None of the students were able to complete independently all of the play responses in the sequence of steps for the Simon game. However, Nancy was able to perform independently several of the steps for the Simon game during the acquisition phase. She was also able to generalize her appropriate play responses (level two play) with the Simon game to the generalization and free play phases. Andrew and Anne did not generalize level two appropriate play responses acquired during the acquisition phase with the Simon game to the generalization phase, however they were able to generalize level one appropriate play responses.

Anne, Andrew and Nancy were also able to generalize skills acquired with the View-Master and Perfection games during the acquisition phase to the generalization phase and the free play phases. Although Irene made a number of appropriate play responses during the acquisition phase, she did not generalize a substantial amount of these responses to the generalization phase and none of these responses were generalized to the free play phase. Several factors may have influenced Irene's behavior during the generalization and free play phases. For example, the length of the three phases together may have been too long for Irene, causing her to become tired or

bored during generalization and free play phases. Also, the type of reinforcement offered to Irene during the acquisition and generalization phases may not have been sufficient for her, reducing the probability of her responses being repeated in the future. External factors, such as Irene's sleep patterns at home during the study could have influenced her performance. During the time of the study, Irene's parents had mentioned that she was having difficulty adjusting to the longer hours of daylight and to daylight saving time; as a result, Irene was only sleeping for short periods during the night and was attempting to sleep during the day. Irene also attempted to sleep during the generalization and free play phases, this may explain some of the wide fluctuations in her data during these phases.

Similar factors, such as boredom and the length of the sessions may have also caused the variability that occurred throughout the generalization and free play phases with Andrew, Anne and Nancy. The data plots within these phases suggest that occasionally control over the subject's behaviors can be influenced by other factors in addition to the two treatment methods (Parsonson & Baer, 1978). No consistent pattern in the subjects' performance was apparent to indicate that time of day, sequence of toy instruction, treatment method used and/or instructor involved was causing the variability to occur. However, Nancy's level of appropriate play responses seemed to decrease towards the second half of the generalization and free play phases suggesting that she was becoming bored with the games. Also, during several sessions, Anne and Andrew did not interact with the toys. Rather, they rested while lying on the floor suggesting that they were either bored with the toys or that the length of the three phases combined was too long. The loss of interest in the games or boredom with the activities after a certain length of time is not unusual for children of this age. However, because of the decrease in the students' appropriate play responses from the acquisition phase to the generalization and free play phases, it is recommended that future studies

of this nature should teach games to criterion before introducing the generalization and free play phases. That is, continue the acquisition phase in isolation until the students are able to perform without assistance all the appropriate play responses in the sequence of steps for the games prior to introducing the generalization or free play phases. In addition, achieving mastery during the acquisition phase would increase the intrinsic reinforcement value of the games and thereby increase the likelihood of maintenance and generalization of appropriate play. Prior to the introduction of the generalization and free play phases, time between instructional sessions could be gradually and systematically increased so that the students were able to retain the skills learned from initial to subsequent sessions, which may be separated by a period of one week. This procedure may reduce the possibility of the students' interest in the games or activities decreasing during the generalization and free play phases. Also, because the students seemed to enjoy playing the games when the instructors were interacting with them, another option would be to teach two or more students simultaneously. Other students present during the three phases might serve as a discriminitive stimulus during the generalization and free play phases thereby increasing the probability of the students' appropriate play responses being repeated during these phases.

The large variability of the data during generalization and free play phases made it difficult to discern any significant differences in performance from the two treatment methods. Out of the thirty-six analyses conducted during the generalization and free play phases, only three indicated superiority of Method 2 over Method 1. In any case, Nancy was the only student for when Method 2 was superior to Method 1. In addition, only six out of the thirty-six analyses indicated that Method 1 was superior to Method 2. There may have been no significant difference between these two methods, or alternatively there may have been a carry-over effect from one method to the other. In future studies of this nature, it is recommended to alternate each method with the

baseline condition periodically throughout the phases of study to determine if a carry-over effect does exist (Barlow & Hensen, 1984). For example, if there is no change in M-1 when it is alternated with the baseline condition compared to M-1 when it is alternated with M-2, then it would be safe in assuming that M-1 is not experiencing carry-over effects from M-2. Also, a functional manipulation of one of the treatments could be conducted in addition to the alternation with the baseline condition to test the strength of a treatment (Barlow & Hensen, 1984). For example, four sessions of the random alternation of M-1 and M-2 could be followed by several sessions of M-2 in isolation, followed again by the random alternation of M-1 and M-2. If M-2 resulted in a deterioration of performance in isolation, then M-1 could be having a positive carry-over effect on M-2. If M-2 showed a significant increase in positive results in isolation of M-1, then M-2 could be a stronger treatment method compared to M-1. Time periods between sessions could also be lengthened to reduce possible carry-over effects.

The eight analyses in which either M-1 or M-2 were identified as superior methods of treatment may be useful in selecting a suitable method for each student. With Irene and Anne, there was no significant difference between M-1 and M-2 during the generalization and free play phases, therefore the selection of instructive methods for future instruction could be up to the preference of the instructor carrying-out the instruction. For example, some instructors may find audible tones signalling reinforcement disruptive to the normal environment and would therefore prefer using M-1 over M-2. However, because three of the analyses conducted with Nancy indicates superiority of M-2 over M-1 and because there was no significant difference M-1 and M-2 within the rest of the analyses, M-2 would be a preferred method to use with Nancy and would increase the probability that the transfer of stimulus control would occur when compared to using M-1. In addition, because four of the analyses with Andrew found that M-1 was superior to M-2, and because no significant

difference was found between the M-1 and M-2 in the remaining analyses, M-1 would be a preferred method in transferring stimulus control with Andrew. In the video tapes of Andrew, where M-1 produced more appropriate play responses than M-2, it was apparent that on several occasions when the tone sounded prior to the administration of reinforcement, Andrew looked up away from the games he was playing with toward the sound suggesting that the tone was actually diverting his attention from toy play. This observation supports the use of M-1 over M-2 with Andrew during situations where visual performance is expected. The alternating treatment design is a useful device when used in this way, because an assessment of this nature can be conducted in a relatively short period of time and differences between methods will usually appear early in the implementation of the treatments (Barlow & Hensen, 1984).

The objective of the study was to teach the students play skills so that they could play without assistance in the absence of supervision. Analyses of figures 42,43 and 44 provide the information necessary to test this objective. Figures 42, 43 and 44 show the students' number of level one and level two appropriate play responses during the free play phases. Within the free play phases no instructor was present and the students were expected to play without assistance. Analyses indicates that the objective of the study was met with three of the four students. During 14 of the 20 sessions, Andrew played with the games and he preferred the View-Master and Perfection games over the Simon game. Anne played with the games during 25 out of 27 sessions and she also preferred the Perfection and View-Master games over the Simon game. Irene played with the View-Master during only one of the 29 sessions, therefore with Irene the objective of the study was not reached. Nancy played with the games during 16 of the 30 sessions. However, her appropriate play responses deteriorated during the second half of the study for reasons already suggested. During the first half of the study Nancy did not seem to have a preference for one game over

another. Data from the first half of the study with Nancy provide evidence to support the objective of this study.

In summary, the objective of the study was met because three of the students did play with the games without assistance and supervision during the free play phases. The increasing assistance treatment method was an effective procedure for teaching play skills to these students. The effectiveness of the method of transfer of stimulus control used to generalize play skills acquired during the acquisition phase to the generalization and free play phases depended on the individual student. For two of the students, there was no significant difference between the two methods used to transfer stimulus control, one student benefitted to some extent from Method 1 and one student benefitted to a degree from Method 2. Regardless of the method used, all students transferred play skills to the generalization phase and three of the four students transferred play skills to the free play phase. The study supported previous research indicating the effectiveness of the increasing assistance treatment method and reinforcement schedules as effective procedures for use in teaching skills to students with severe handicaps.

REFERENCES

Affleck, M., (1985). Recognizing the values and power of play. Early Childhood Education, 18(2), 18-19.

Albrecht, D. (1985). The value of play in learning. Early Childhood Education, 18(2), 23-25.

Bambara, L. M., Spiegel-McGill, P., Shores, R. E., & Fox, J. J. (1984). A comparison of reactive and nonreactive toys on severely handicapped children's manipulative play. Journal of the Association for Persons with Severe Handicaps, 9(2), 142-149.

Barlow, D. H., & Hersen M. (1984) Single case experimental designs strategies for studying behavior change. Willowdale, Ontario: Pergamon

Bennett, D., Gast, D., & Wolery, M. A comparison of two prompting procedures: Time delay and system of least prompt in teaching expressive sign labels. In poster session presentation. A comparison of two prompting procedures: Time delay and system of least prompt, American Association on Mental Deficiency Annual Meeting, Boston, June 1982.

Billingsley, F. F., Romer, L. T. (1983). Response prompting and the transfer of stimulus control: Methods, research, and a conceptual framework. The Journal of the Association for Persons with Severe Handicaps, 8(2), 3-12.

Colbens, D. (1985). Play - The child's real world. Early Childhood Education, 18(2), 26-27.

Csapo, M. (1981). Comparison of two prompting procedures to increase response fluency among severely handicapped learners. Journal of the Association for Persons with Severe Handicaps, 6(1), 39-47.

Doyle, P. M., Wolery, M., Ault, M. J., & Gast, D. L. (1988). System of least prompts: A literature review of procedural parameters. Journal of the Association

for Persons with Severe Handicaps, 13(1), 28-40.

Ellis, M. J. (1973) Why people play. Englewood Cliffs, N. J.: P-H

Fagan, J. (1986/87). The diagnostic and therapeutic uses of play. Early Childhood Education, 20 (1), 7-12.

Falvey, M. A. (1986). Community-based curriculum instructional strategies for students with severe handicaps. Baltimore, London: Paul H. Brookes.

Gentry, D., Day, M., & Nakao, C. The effectiveness of two prompt sequencing procedures for discrimination learning with severely handicapped individuals. Manuscript submitted for publication, 1980.

Godby, S., Gast, D., & Wolery, M. A comparison of two prompting procedures: Time delay and system of least prompt in teaching object identification. In poster session presentation, A comparison of two prompting procedures: Time delay and system of least prompt, American Association on Mental Deficiency Annual Meeting, Boston, June 1982.

Hopper, C., & Wambold, C. (1978). Improving the independent play of severely mentally retarded children. Education and Training of the Mentally Retarded, 13, 42-46.

Hill, J. W., Wehman, P., & Horst, G. (1982). Toward generalization of appropriate leisure and social behavior in severely handicapped youth: Pinball machine use. Journal of the Association for Persons with Severe Handicaps, 6(4), 38-44.

Parsonson, B. S. & Baer, D. M. (1978). The analysis and presentation of graphic data. In T. R. Kratochwill (Ed.), Single subject research strategies for evaluating change (pp. 101-165). New York: AP.

Renzaglia, A., & Snell, M. Manual sign training for the severely handicapped: Time delay and a system of least prompts. Manuscript submitted for publication, 1981.

Sailor, W. & Guess, D. (1983). Severely handicapped students an instructional

design. New Jersey: Houghton Mifflin Company.

Santarcangelo, S., Dyer, K., & Luce, S. C. (1987). Generalized reduction of disruptive behavior in unsupervised settings through specific toy training. Journal of the Association for Persons with Severe Handicaps, 12(1), 38-44.

Snell, M. E., & Gast, D. L. (1981). Applying time delay procedure to the instruction of the severely handicapped. Journal of the Association for Persons with Severe Handicaps, 6(1), 3-14.

Sykes, J. B. (Ed.). (1982). The concise oxford dictionary (7th ed.). Oxford: Clarendon Press.

Tawney, J. W., & Gast, D. L. (1984). Single subject research in special education. Columbus, Ohio: Charles E. Merrill.

Wambold, C., & Bailey, R. (1979). Improving the leisure-time behaviors of severely/profoundly mentally retarded children through toy play. AAESPH Review, 4(3), 237-250.

Wehman, P. (1977). Helping the mentally retarded acquire play skills. Springfield, Illinois: Charles C Thomas.

Wuerch, B. B., & Voeltz, L. M. (1982). Longitudinal leisure skills for severely handicapped learners. Baltimore, London: Brookes.

Appendix A

Data Sheets

Student's Name: _____ Date: _____

Data Collector: _____ Instructor: _____

Instructional Toy Sequence: _____ Method: 1 or 2 (Circle)

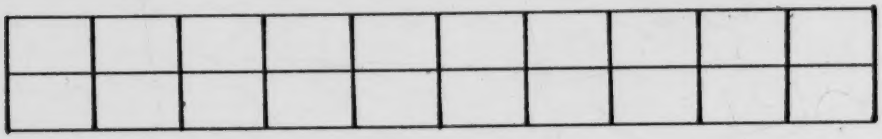
Inappropriate Behaviors

Record any occurrence of inappropriate behaviors plus the time of occurrence (e.g., 2 mouths, 1:02 mins) in the corresponding column.

	Acquisition	Generalization	Free Play
a) Self-abusive Behaviors (e.g. hitting self)			
b) Stimulatory Behavior (e.g., flicking object in front of eyes)			
c) Socially Inappropriate Behavior (e.g., crying, spitting, licking floor)			
d) Destructive Behavior (e.g., throwing objects, peeling paper off toys)			

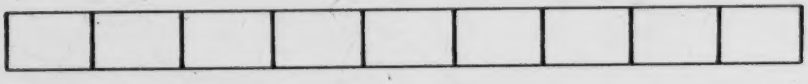
Reinforcement Schedule Acquisition Phase

At the sound of the tone, record whether or not the student earned reinforcement. If the student earned reinforcement mark an *x* in the column, if the student did not earn reinforcement mark a *0* in the column. If instructional Method 1 is being used, attach headphones to the taperecorder.



Reinforcement Schedule Generalization Phase

At the sound of the tone, record whether or not the student earned reinforcement. During the generalization phase, the student will receive reinforcement during five of the nine intervals for occurrences of appropriate play responses. The five intervals the student is to receive reinforcement will vary from session to session. If the student earned reinforcement mark an *x* in the corresponding box, if the student did not earn reinforcement mark a *0* in the corresponding box. Do not reinforce the student during those intervals that are shaded (4 out of 9 intervals).



Appropriate Play Responses

1. During the acquisition phase record beside each step in the sequence of steps for each game, whether the student completed the step without assistance (N), or with a verbal (V), gestural (G), or physical (P) prompt.

2. During the generalization and free play phases, record observations of appropriate toy play responses. Classify appropriate toy play responses as level one (L1) or level two (L2) by placing an *X* under the corresponding

column beside the corresponding step in the sequence of steps for each toy. Record the time of occurrence (or duration of occurrence) beside each appropriate toy play responses (or group of toy play responses).

Perfection Game: Sequence of Steps

	Acquisition	Generalization		Free Play	
		L1	L2	L1	L2
1. Push switch to off					
2. Push tray down					
3. Turn timer to 60 second					
4. Turn switch to on					
5. Pick up puzzle piece					
6. Place puzzle piece in corresponding slot					
7. Pick up 2nd puzzle piece					
8. Place puzzle piece in corresponding slot					
9. Pick up 3rd puzzle piece					
10. Place puzzle piece in corresponding slot					
11. Pick up 4th puzzle piece					
12. Place puzzle piece in corresponding slot					
13. Pick up 5th puzzle piece					
14. Place piece in corresponding slot					
15. Pick up 6th puzzle piece					
16. Place piece in corresponding slot					
17. Stop timer					
18. Take puzzle piece out of game					

Simon Game: Sequence of Steps

	Acquisition	Generalization		Free Play	
		L1	L2	L1	L2
1. Slides game indicator left to 1.					
2. Slides skill indicator left to 1.					
3. Slides on/off button right to *on*.					
4. Press start button.					
5. Press colored lense after it lights up (within 5 secs.).					
6. Press 1st colored lense (within 5 secs) and 2nd colored lense (within 5 secs.).					
7. Press 1st, 2nd and 3rd colored lense within 5 secs. of each other.					
8. Press 1st, 2nd, 3rd & 4th colored lense.					
9. Press 1st, 2nd, 3rd, 4th & 5th colored lense.					
10. Press 1st, 2nd, 3rd, 4th, 5th & 6th colored lense.					
11. Press 1st, 2nd, 3rd, 4th, 5th, 6th & 7th colored lense.					
12. Press 1st, 2nd, 3rd, 4th, 5th, 6th, 7th & 8th colored lense.					
13. Presses start button after error and starts over.					
14. Turns switch indicator left to *off* when finished game.					

View-Master Game: Sequence of Steps

	Acquisition	Generalization		Free Play	
		L1	L2	L1	L2
1. Pick up envelope.					
2. Take reel out of envelope.					
3. Place reel and envelope on floor.					
4. Pick up View-Master.					
5. Place eye piece towards self.					
6. Rotate View-Master so that orange lever is in top right hand corner.					
7. Pick up reel.					
8. Turn reel so that words are facing self.					
9. Place reel in slot on top of View-Master.					
10. Push reel down till reel does not move down any further.					
11. Bring View-Master towards eyes.					
12. Rest View-Master against eyes with left hand.					
13. Pull orange lever down with right hand.					
14. Look at picture in View-Master.					
15. Take reel out of View-Master.					
16. Place View-Master on table.					
17. Pick up envelope.					
18. Place reel in envelope.					
19. Place envelope on floor.					